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RAILWAY LOCOMOTIVES AND CARS

formerly
United Mechanical and
Electrical Engineers

MAY 1955

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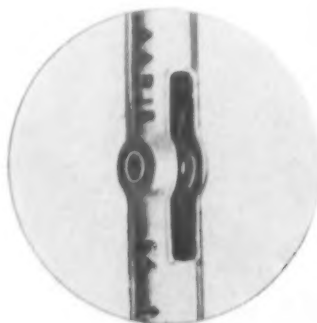
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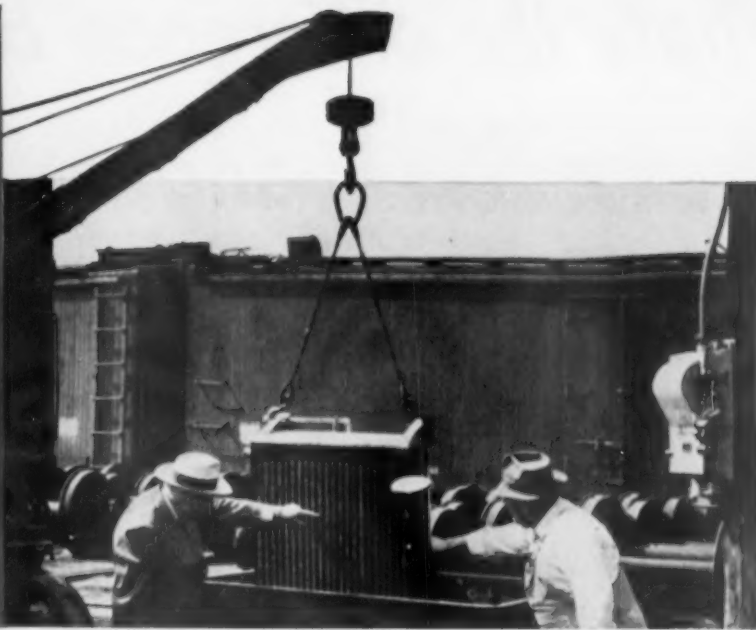
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You simply cannot avoid ordinary wear on brake heads—or burned faces due to lost shoes—but Truslock makes this, the most prevalent of all brake beam troubles, absolutely painless. Truslock quick-change brake heads are removable and interchangeable on either end of the brake beam, so that a new head may be slipped on right at the car without the use of special tools. With Truslock you no longer pull out the entire brake beam to change a head.

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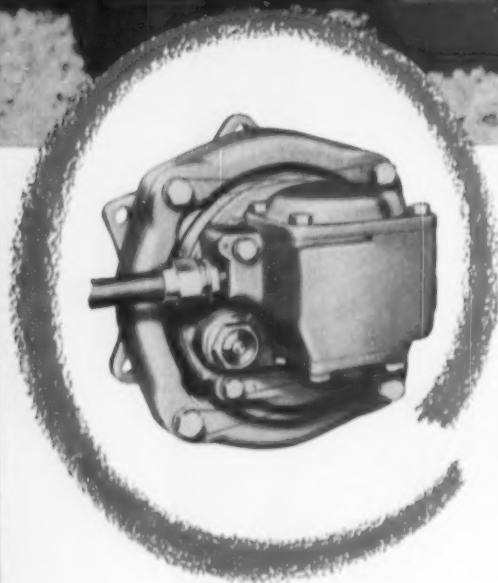
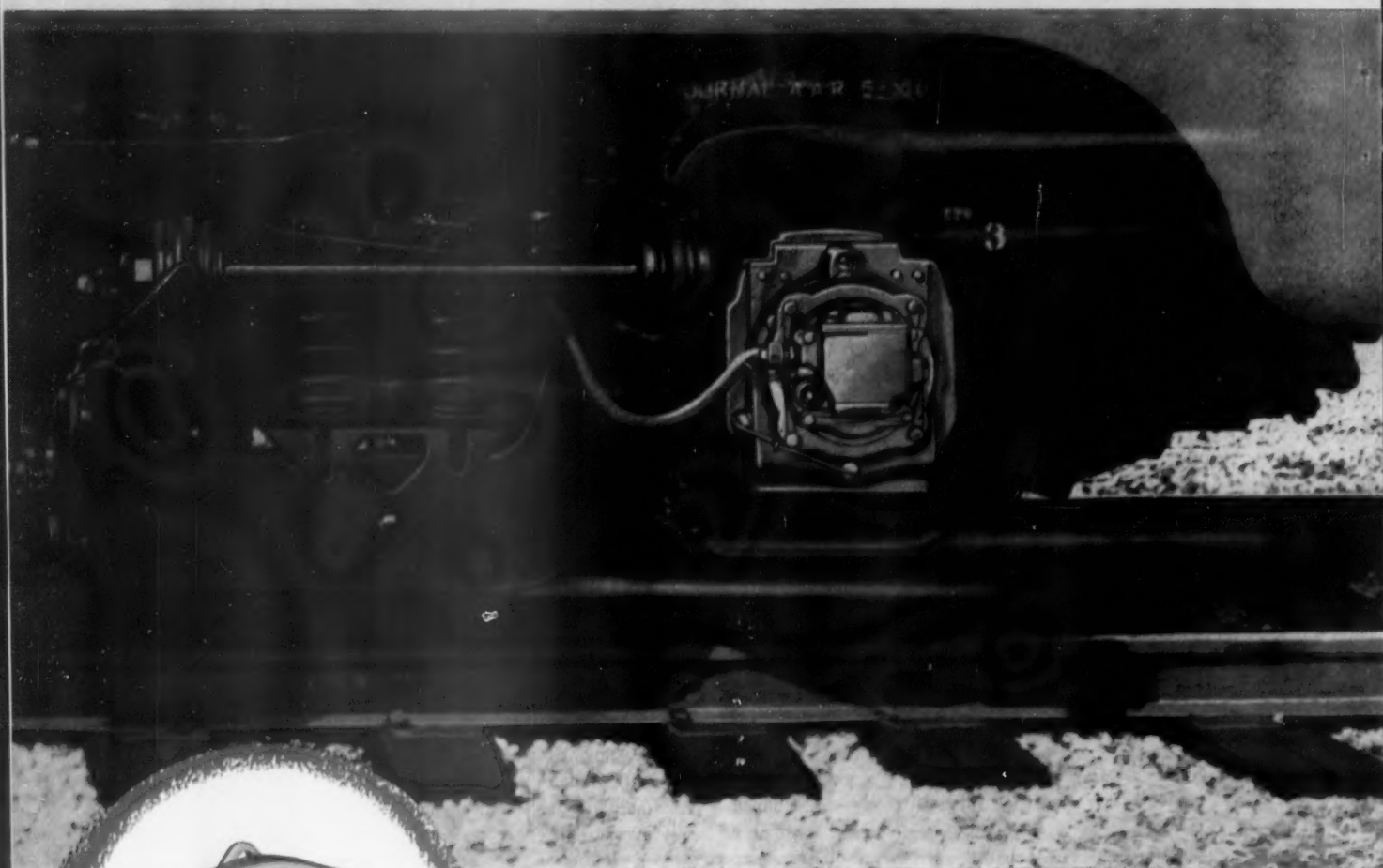


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79 West Monroe St., Chicago 3

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FOREIGN REPRESENTATIVES.

Sibley-Fields Publishing Company, Ltd.
48 London Wall, London E.C. 2, England
Linder Presse Union GMBH
International Advertising Agency
(16) Frankfurt a. Main
Wittelsbacher Allee 60, West Germany



Railway Locomotives and Cars is a member of the Associated Business Papers (A.B.P.) and the Audit Bureau of Circulation (A.B.C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U.S.A.

RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

MAY, 1955

VOLUME 129, NO. 5

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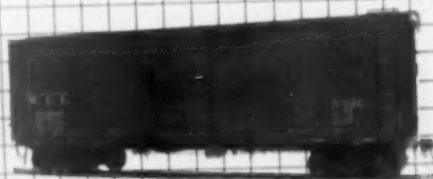
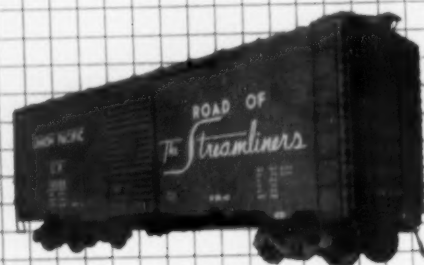
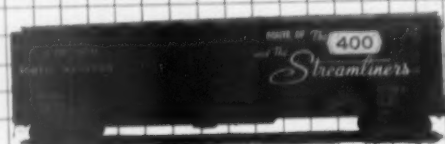
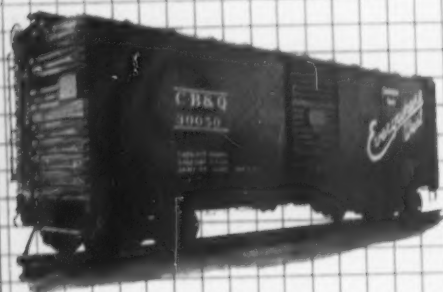
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Published monthly by the Simmons-Boardman Publishing Corporation at 1309 Noble St., Philadelphia, Pa. Entered as second-class matter, January 16, 1953, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription Price to railroad employees only in U.S., U.S. possessions and Canada, \$2 one year, \$3 two years, payable in advance and postage free. Subscription price to railroad employees elsewhere, \$5 per year. Single copies, 50¢. Address correspondence concerning subscriptions to Robert G. Lewis, Vice-Pres. and Dir. of Circulation, 30 Church St., New York 1.

Simmons-Boardman Publishing Corporation: James G. Lyne, President, New York; Samuel O. Dunn, Chairman Emeritus, Chicago; J. S. Crane, Vice-Pres. and Sec., New York; H. H. Melville, Vice-Pres., Cleveland; C. W. Merriken, Vice-Pres., New York; John R. Thompson, Vice-Pres., Chicago; Win. H. Schmidt, Jr., Vice-Pres., New York; John S. Vreeland, Vice-Pres., New York; Fred W. Smith, Vice-Pres., Chicago; Robert G. Lewis, Vice-Pres., New York; Arthur J. McGinnis, Exec. Vice-Pres. and Treasurer, New York; John Gannon, Jr., Asst. Treas., New York.

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These facts have not been overlooked by the railroad industry. For it is on the basis of *proved superior performance*, that those railroads which lead in ownership of COR-TEN-built equipment, have through the years added more and more of such cars to their lines.

Take the Southern Pacific for example. This railroad commenced using COR-TEN Steel in 1946. Now has 20,350 box and auto-box cars using COR-TEN in service—enough to make a train 176 miles long. Most of these cars were ordered after the original equipment had proved the merits of COR-TEN Steel construction.

The Union Pacific is another long-time user of COR-TEN Steel box cars. Since 1937 when the first order was placed, fourteen successive orders have brought the total of COR-TEN Steel box cars in U.P. service to 17,080, many of them built in their own shops.

The Milwaukee Road has used COR-TEN Steel in 14,060 box cars built from 1936 to 1949. The C.B. & Q. has used COR-TEN Steel in 10,700 box cars, the Great Northern in 5500, and the Pennsylvania in 2600.

Also enjoying the economic benefits of COR-TEN Steel construction are the Rio Grande, the Santa Fe, the Chicago and North Western, the Lackawanna, and other leading roads which, like all operators of freight equipment, are careful to invest their dollars where they know they will get the biggest return on their money.

We can think of no better reason than this for suggesting that you too investigate the *cost-reducing and revenue-increasing* advantages of USS COR-TEN Steel construction. We will be glad to discuss this matter with you anytime at your convenience.

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UNITED STATES STEEL

NEWS.....

SP Gets New Research Department

Increased research activities of the Southern Pacific are now coordinated under a newly created Department of Research and Mechanical Standards, headquarters at the railroad's general offices in San Francisco, with field laboratories at Sacramento, Roseville, Ogden, Los Angeles and El Paso. The new department is headed by P. V. Garin, formerly engineer of tests, and is part of the motive power department, headed by B. M. Brown, under Vice-President J. W. Corbett (operations).

The enlarged Sacramento laboratory staff now totals 22 persons. Facilities there have been modernized so the laboratory can serve more efficiently as the center for chemical and physical analyses and material inspection and testing for all SP lines west of El Paso, and also for certain tests done for Pacific Fruit Express Company, jointly owned by SP and Union Pacific. Laboratories at other points are mostly concerned with testing of diesel locomotive parts, fuels and lubrication.

Also under jurisdiction of the new department are a number of research projects, some of which are being handled with help of the Stanford Research Institute, of which SP is an associate member. Currently under way are projects to develop a cushioning coupler for freight cars, more effective sanding devices for locomotives, better consumption of heavier fuel oil, improved fire protection for cotton shipments, and stronger shipping containers. A transparent box car has been built for visual study of various methods of tying down loads for safe movement. Laboratory work and research are closely coordinated with similar work carried on by the Association of American Railroads.

The functions and duties of the Sacramento laboratory cover a wide field, from routine inspection of purchased and company-manufactured or processed material, to applied research and development on projects necessary to the safe and efficient operations of the shops, locomotives and cars. The laboratory contributes to improvement and safety of railroad operation by conducting investigations into cause of defective tools and parts, and advises as to preventive changes in materials, designs, processes and practices. A recent addition includes equipment for gamma ray and ultrasonic testing.

One function of the department is to test car wheels manufactured in Sacramento shops to be sure they meet AAR specifications. Last year 52,169 chilled cast-iron car wheels turned out by the wheel foundry passed this rigid inspection. Also laboratory-controlled during the year were 193,000 freight-car journal bearings turned out by the railroad's Sacramento brass foundry. Chemical analysis check was made on many thousands of pounds of other brass products, and on approximately 650,000 lb of anti-friction alloys.

The Sacramento oil laboratory, equipped

with a spectrograph, serves as control station for districts not served by other established diesel control laboratories of the railroad. Diesel crank-case oil and radiator cooling water are sent here for checking. Analysis of oil and water can disclose how an engine is functioning and wearing, and can indicate when over-hauls should be made in order to avoid a breakdown in service. Considerable research is done on greases.

A process for reclaiming journal-box oil was worked out at the laboratory, and reclamation of various other oils is carefully controlled by laboratory tests. The

tests of so-called economy type fuels have been carried on in close cooperation between the Research Department personnel and the other departments of the railroad.

Among the testing devices at the laboratory is a weather-ometer, which can test the wearing ability of paints by subjecting them to years of weathering in a comparatively short time.

Many of the functions of this laboratory are also performed in other field laboratories, which in each case are housed adjoining the shops where diesel locomotives are serviced. This allows the tests

(Continued on page 10)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM L.C.C. M-211 AND M-240)

Item No.		Month of January	
		1955	1954
3	Road locomotive miles (000) (M-211):		
3-05	Total, steam	4,803	7,883
3-06	Total, Diesel-electric	34,258	31,265
3-07	Total, electric	697	623
3-04	Total, locomotive-miles	39,972	39,841
4	Car-miles (000,000) (M-211):		
4-03	Loaded, total	1,536	1,474
4-06	Empty, total	911	867
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):		
6-01	Total in coal-burning steam locomotive trains	10,539	14,967
6-02	Total in oil-burning steam locomotive trains	1,239	2,623
6-03	Total in Diesel-electric locomotive trains	94,345	84,725
6-04	Total in electric locomotive trains	2,103	1,842
6-06	Total in all trains	108,934	104,390
10	Averages per train-mile (excluding light trains) (M-211):		
10-01	Locomotive-miles (principal and helper)	1.02	1.02
10-02	Loaded freight car-miles	41.00	39.80
10-03	Empty freight car-miles	24.40	23.40
10-04	Total freight car-miles (excluding cabooses)	65.50	63.20
10-05	Gross ton-miles (excluding locomotive and tender)	2,916	2,816
10-06	Net ton-miles	1,289	1,245
12	Net ton-miles per loaded car-mile (M-211)	31.30	31.36
13	Car-mile ratios (M-211):		
13-03	Per cent loaded of total freight car-miles	62.80	63.00
14	Averages per train hour (M-211):		
14-01	Train miles	19.20	18.80
14-02	Gross ton-miles (excluding locomotive and tender)	55,406	52,304
14	Car-miles per freight car day (M-240):		
14-01	Serviceable	43.30	40.70
14-02	All	40.70	38.80
15	Average net ton-miles per freight car-day (M-240)	801	765
17	Per cent of home cars of total freight cars on the line (M-240)	52.80	53.70

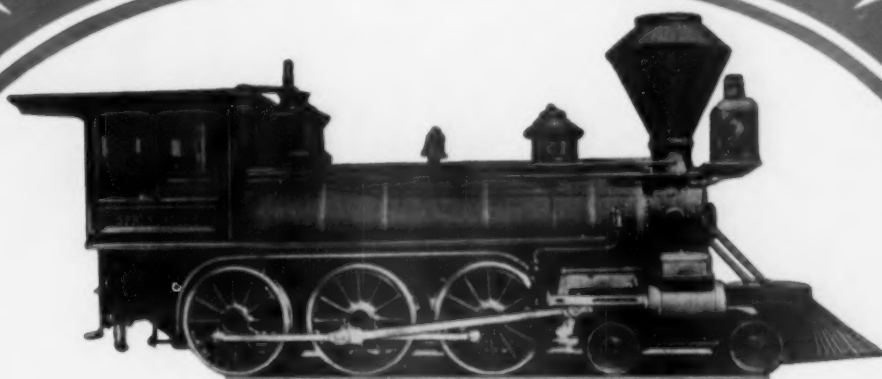
PASSENGER SERVICE (DATA FROM L.C.C. M-213)

3	Road motive-power miles (000):		
3-05	Steam	1,449	2,895
3-06	Diesel-electric	21,272	21,288
3-07	Electric	1,414	1,496
3-04	Total	24,136	25,681
4	Passenger-train car-miles (000):		
4-08	Total in all locomotive-propelled trains	243,606	258,010
4-09	Total in coal-burning steam locomotive trains	8,446	13,200
4-10	Total in oil-burning steam locomotive trains	3,861	8,997
4-11	Total in Diesel-electric locomotive trains	215,153	217,150
12	Total car-miles per train-mile	9.73	9.70

YARD SERVICE DATA FROM L.C.C. M-215

1	Freight yard switching locomotive-hours (000):		
1-01	Steam, coal-burning	239	373
1-02	Steam, oil-burning	41	53
1-03	Diesel-electric	3,433	3,321
1-06	Total	3,722	3,759
2	Passenger yard switching hours (000):		
2-01	Steam, coal-burning	9	14
2-02	Steam, oil-burning	4	4
2-03	Diesel-electric	257	268
2-06	Total	298	317
3	Hours per yard locomotive-day:		
3-01	Steam	4.40	4.90
3-02	Diesel-electric	15.00	15.00
3-05	Serviceable	14.70	14.10
3-06	All locomotives (serviceable, unserviceable and stored)	12.70	12.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.68	1.77
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.76	0.76

¹Excludes B and trailing A units.



Built by Baldwin in 1869, the "Springville" served freight routes of the Lehigh Valley until 1905. A 4-6-0 type, it had 54" drivers and a total weight of 80,304 lbs.



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Good enough to show in cross section the soft gray iron hub metal which is easily machinable. This means faster and less costly mounting on axles.

And good enough to show the extreme hardness of the white metal (chilled iron) that gives maximum service with minimum loss of metal, and assures retention of rotundity throughout the long life of the wheel.



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The improved AMCCW wheel, adopted in 1950, has a better distribution of metal from hub to flange to withstand the stresses developed under today's operating conditions. Originally a theory, backed by laboratory tests, this is now a fact backed by the performance of over five million of these wheels in service.

A spectacular reduction in failures, combined with the advantage of fewer loose chilled wheels and far less derailments charged to worn flanges, has given the chilled car wheel a safety record unequalled in freight car service.

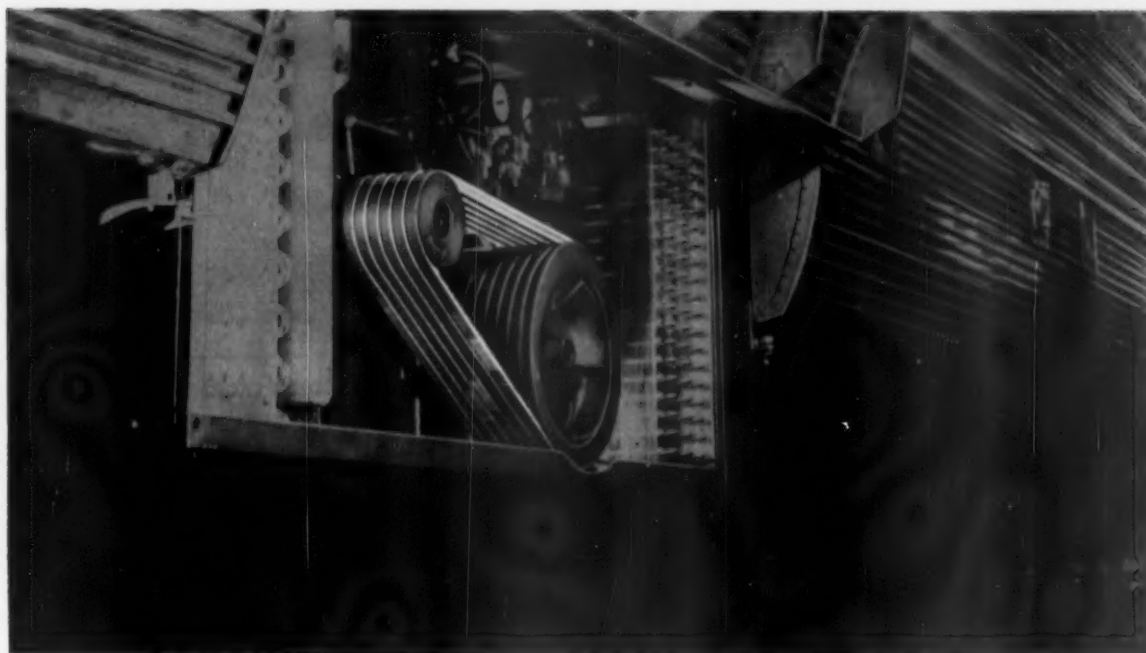
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Low exchange cost
Increased ton mileage
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AMCCW plant inspection
Easier shop handling



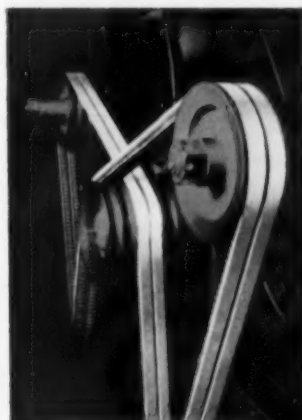
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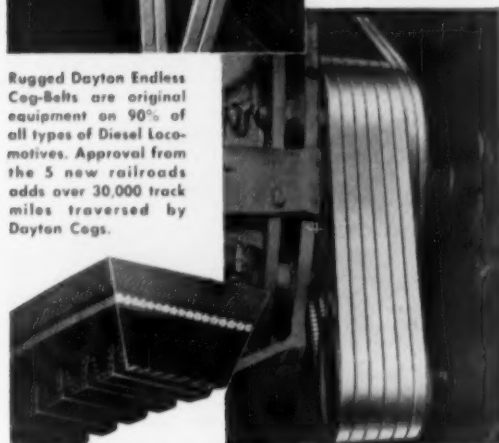
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V-Belts are ruggedly
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processed materials to withstand
grueling punishment.

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The reason Dayton Cog-Belts are being approved by Mechanical and Electrical Engineers everywhere is because they solve a basic and ever-present problem — the need for continuous, dependable power. Power for diesel drives — for blowers, auxiliaries and engine drives. Power for unfailing air-conditioning drives. Power for every conceivable application.

Here are more reasons: Dayton Endless Cog-Belts are especially designed for Railway service — oil proof, heat resistant, low stretch, high flexibility. Dayton Endless Cog-Belts are furnished in all of the special lengths that are required for diesel and air conditioning applications.

Dayton Engineers will gladly work with you to help you turn your V-drive problems into improved service, greater passenger comfort, at lower operating costs. Get the money-saving facts on longer lasting Dayton Endless Cog-Belts right away. Direct your request to Dayton Rubber Co., Railway Division, Dept. 203, Dayton 1, Ohio.

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*T.M.

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Dayton Rubber
YEARS OF PROGRESS

World's Largest Manufacturer of V-Belts



THE NEW "TUBULAR TRAIN" just ordered by the Pennsylvania from the Budd Company (see footnote 14 to table of Orders and Inquiries for New Equipment on page 11) will weigh approximately 40% less, have a lower center of gravity, and be almost two feet lower in overall height, than a conventional train. The seven passenger-carrying cars, plus a power car, will be, in effect, steel tubes, with the car structures doing the work of conventional steel underframes.

SP Research Dept.

(Continued from page 6)

to be promptly made on arrival of locomotives at terminal. They are serving to check on diesel-engine condition so service and over-hauls can be done more effectively and road failures prevented, President Russell explained.

Atomic Locomotive Study Authorized

A contract for a study of a new nuclear-power reciprocating engine for locomotive propulsion was signed in Washington, D.C., March 24.

Admiral Lewis L. Strauss, chairman of the Atomic Energy Commission, made the announcement, while the contract itself was signed by James F. Connaughton, vice-president of the Baldwin-Lima-Hamilton Corporation, and Joseph L. Henning, Washington representative of the Denver & Rio Grande Western.

Under terms of the study agreement, the road and manufacturer will investigate engineering, technical and economic aspects of building and operating a nuclear-powered reciprocating engine for locomotives. The two companies will finance the study and will have at their disposal information developed by the AEC which may be applied to their research, in addition to consultation and assistance from AEC personnel as needed.

An AEC spokesman emphasized that there is not now any such locomotive engine under construction and said the D&RGW-BLH project does not involve building one. The study is scheduled to run for one year at the end of which time a report will be made to the AEC with recommendations for future work.

Heads of the two companies which will cooperate in the study said:

Wilson McCarthy, president, D&RGW:—"We believe the study project authorized by the Atomic Energy Commission presages a new concept of the utilization of atomic power for railroads. The basic principle

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE APRIL ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	No. of units	Horse-power	Service	Builder
Central of Georgia	6 ¹	1,750	Road switching	Electro-Motive
Chicago & Illinois Midland	23	1,200	Switching	Electro-Motive
New York Central	1 ¹	1,000	Passenger	Baldwin-Lima-Hamilton
New York, Chicago & St. Louis	324	1,750	Road switching	Electro-Motive
New York, New Haven & Hartford	23	1,000	Passenger	Baldwin-Lima-Hamilton
Union Pacific	2	2,400	Passenger	Electro-Motive
	20	1,000	Switching	American Locomotive

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
American Refrigerator Transit Co.	100 ¹	70-ton insulated box	Pacific Car & Fdry.
Chesapeake & Ohio	40	10-ton insulated box	Pacific Car & Fdry.
Chicago & North Western	500 ²	Box	Pullman-Standard
Chicago Great Western	25 ¹	Caboose	International Ry. Car
Missouri-Kansas-Texas	10	Caboose	International Ry. Car
Monongahela Connecting	25 ¹	70-ton gondola	Bethlehem Steel Co.
North American Car Corp.	75	Gondola	Greenville Steel Car
Pennsylvania	8 ¹	70-ton covered hopper	Pullman-Standard
Pittsburgh & West Virginia	200 ¹	Flat	Company shops
Reserve Mining Co.	50 ¹	70-ton covered hopper	Pullman-Standard
Southern	4	Caboose	International Ry. Car
Union Tank Car Co.	50	50-ton box	Pullman-Standard
	5	Tank	Company shops
	400	11,000 gal. tank	Company shops
	100	8,000 gal. tank	Company shops
	301	10,000 gal. tank	Company shops
Union Pacific	300 ¹	50-ton box	Company shops
	100	Caboose	Company shops
	300	Stock	Company shops
	300	Flat	Company shops
Wabash	300 ¹	50-ton box	General American Trans.
Western Pacific	250 ¹	Box	Pullman-Standard
	50	Flat	Pullman-Standard
	20	Special insulated box	Pullman-Standard

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Atchison, Topeka & Santa Fe	35 ¹	Chair	Budd Co.
	6	Diners	Budd Co.
	6	Dome-lounge	Budd Co.
New York Central	See footnote 3.		Pullman-Standard
New York, New Haven & Hartford	See footnote 3.		Pullman-Standard
Pennsylvania	See footnote 14		ACP Industries
			Budd Co.

¹ To have been delivered in April. Estimated unit price, \$196,037.

² To have been delivered in April.

³ Equipment for the New York Central and the New Haven for "revolutionary low-center-of-gravity passenger trains" which will weigh and cost "about a third as much as present so-called lightweight equipment." The NYC, according to the announcement made by the two roads upon the signing of orders, has advised General Motors Corporation that the railroad will take the first of GM's new lightweight train, including motive power, "when and if this train becomes available." According to present plans the announcement said, the GM train "will be tested on the New Haven late this year."

Alfred E. Perlman, NYC president, addressing a March 29 luncheon meeting of the Traffic Club of New York, said the road is buying and will try out a diesel-hydraulic locomotive built in Germany.

The Baldwin-built locomotives for the new trains will weigh about 135,000 lb each, will be 11 ft high and 46 ft long, the announcement said. One will be at each end of the New Haven train, enabling it to operate in either direction without having to turn. Power for the locomotives will be provided by a 1,000-hp, 12-cylinder diesel engine mounted on a two-axle driving truck and delivering its power through a four-speed torque converter transmission.

One 400-hp six-cylinder unit will provide light, heat and air-conditioning for the entire train.

"The principle of packaged maintenance, rather than progressive maintenance, will be utilized," the announcement added. "After operating for several hundred thousand miles, the power units can be easily replaced and the locomotive can be quickly returned to service."

A spokesman for Baldwin-Lima-Hamilton said "certain parts of the engines may be furnished by a German manufacturer."

The equipment ordered by the New Haven from ACF and Electro-Motive Division is in addition to the equipment which the New Haven from the Pullman-Standard Car Manufacturing Company and Baldwin-Lima-Hamilton.

Over 400 passengers will be accommodated in this second "Talgo" train. Its five coaches, each of which will consist of three articulated units, will be powered by two 1,200-hp diesel locomotives, with an extra "transition car" for third-rail electric operation into Grand Central Terminal in New York. To facilitate quick turnaround, the train will have a locomotive at each end, manufactured by the Electro-Motive Division of General Motors Corporation.

The entirely new "Talgo" train is the product of research in the United States and experience in Spain,

and has all the latest technical advances which ACF engineers have developed since the original "Talco" was completed in 1949. That train was the demonstrator which was tried out on the main line of New Haven last summer.

Advantages of the new "Talco" are said to be "strength, improved riding qualities, easy coupling and uncoupling, complete reversibility, and high average speeds." The train will weigh, per passenger, about half of the average streamliner in use today. Center of gravity will be about two feet lower than conventional equipment, and the floor will be only 20 in. above the rails, compared with 54 in. on standard trains.

4 Delivery scheduled for June and July. Estimated cost, \$5,119,467.

5 Delivery schedule for August. Estimated unit cost of the 70-ton cars, \$13,800; of the 40-ton cars, \$12,200.

6 To cost \$5,750,000. To be equipped with special devices for more efficient loading and to prevent damage to lading.

7 For delivery this month.

8 To have been delivered in April. Approximate unit cost, \$3,000.

9 For "TrueTrain" piggyback service. Delivery to begin late this month. The road also has authorized the complete rebuilding and modernization in its Altoona shops of 2,000 box cars. The latter, to have special steel flooring, will start going into service in June.

10 To have been delivered in April. Cost, \$370,000.

11 First to be built will be 100 50-ton insulated box cars, to be followed by 100 cabooses, 200 30-ton box cars with 15-ft doorways, 300 stock cars with metal slats, and 300 50-ton flat cars. All are scheduled for completion this year. Underframes for the insulated box cars, the 200 wide-door box cars, and the cabooses, as well as underframes and other components for the stock cars, are being furnished by the International Steel Company.

12 Delivery scheduled during this month. Fifty cars are for a subsidiary, the New Jersey, Indiana & Illinois.

13 The box car order includes 50 cars with 8-ft doors, 100 double-door cars and 100 double-door cars equipped with Evans automobile loading devices. Twenty of the flat cars will have special bulkheads and hold-down devices for plasterboard loading; four will have hold-down and deck devices for loading automobile frames; and 10 will have hold-down devices for possible use in piggyback service. All the flats will be equipped with roller bearings.

According to Pullman-Standard, the WP will become the first railroad to introduce a 50-ft insulated box car equipped with compartmentizer gates when it takes delivery of these 20 cars next summer. The cars will have refrigerator-type flush doors, and will permit shipment of canned goods in even temperature ranges both summer and winter. The compartmentizer gates will provide protection against losses caused by impacts or shifts in lading.

In addition to the revenue cars, WP directors on March 15 approved purchase of 15 new bay window cabooses costing \$525,000. They will be equipped with electric lights and radio.

14 For re-equipping the "El Capitan," an all chair-car train. By mid-1956, the Chicago-Los Angeles streamliner will then have new "hi-level" coaches, dining cars and dome-lounge cars. The cars are a move in the other direction from the so-called low-slung trains ordered by four other railroads—the Rock Island, the Pennsylvania, the New Haven and the New York Central. Decision to order the new cars was based, according to Santa Fe President Fred G. Gurley, on "favorable public acceptance" of the two experimental units which have been in service since the middle of 1953.

The new cars will be 15½ ft high at 2 ft higher than conventional equipment. Passengers will have a view through spacious windows from reclining seats 8 ft above the rails, or 4 ft higher than the floor of a regular chair car. The extra elevation is said to provide a smoother and more enjoyable ride with less noise and vibration.

The double-level arrangement, which eliminates vestibules, will provide 20 more seats for passengers in each chair car as compared with cars on the present "El Capitan." The new train will have a capacity in its seven chair cars of 496 passengers, compared with the present "El Capitan's" normal capacity of 350 persons in eight cars.

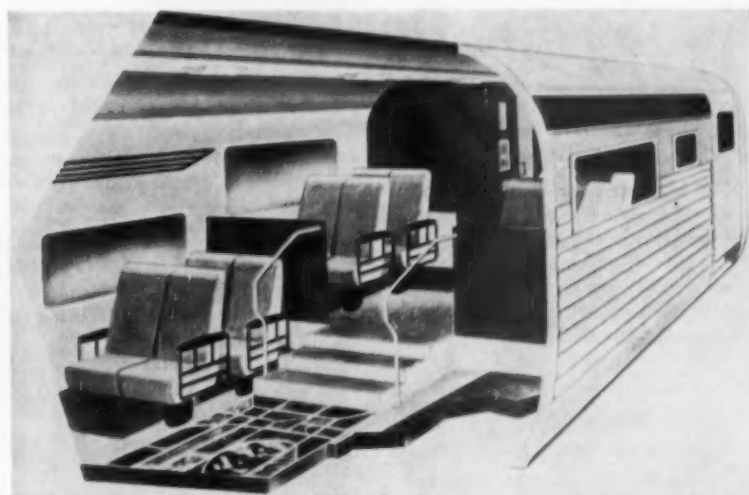
Doors are located at centers of all cars on both sides. Passengers entering chair cars will step directly in from platform level.

Luggage placed on shelves on the lower level will be unloaded at stations through separate openings in sides of cars, leaving vestibules clear to facilitate detraining and entraining of passengers.

Upper levels of dining cars will be devoted entirely to table space for 80 diners, with a kitchen located on the lower deck from which food will be transported to the top level by two elevators.

Dome-type lounge cars, seating a total of 88 patrons on upper and lower decks, will have dome windows the full length of the car on the upper deck, with picture windows 56 in. wide on the lower deck. There will also be a newsstand, a refreshment bar and rest rooms.

15 For the new passenger train of tubular design recently announced by the Pennsylvania (see Proposed Designs of Passenger Equipment, page 6, April issue). The train, to be built of stainless steel, will accommodate 574 passengers and will cost somewhat over \$1,000,000. This will be a cut of about 25 per cent per seat compared with coaches built only three years ago, according to James M. Symes, president of the road. Quantity production later may make possible further cost reductions. Riding on four-wheel trucks under each end, the new cars will be only 11½ ft in height, almost 2 ft lower than existing coaches. Although each will be as long as present cars, 85 ft, weight will be only 77,000 lb, a reduction of approximately 40 per cent.



A TWO-LEVEL FLOOR arrangement will help to achieve a low center of gravity while contributing to a feeling of interior spaciousness in the "tubular train" to be delivered to the Pennsylvania next year. Reclining seats

will be available on both levels, with lounge chairs in a smoking area at one end of each car. Lavatories will be at the far end, as shown in this artist's conception of the interior of one of the seven cars in the train.

on which it rests is the result of a 15-month study by Ray McBrien, Rio Grande engineer of standards and research, working closely with research engineers of Baldwin-Lima-Hamilton. That AEC has authorized us to proceed with this study is a source of great satisfaction to us."

George A. Rentschler, chairman of the board, Baldwin-Lima-Hamilton Corporation:

"It is in the best tradition of our nation that two American companies together have spent almost a year and a half developing this study proposal. Now, with the signing of the contract with AEC, we and the D&RGW will go forward on this study project which could well open the road to a new era in railroading. I pay special tribute to Fred Geitman and John Newton, our engineers, and to Ray McBrien, the D&RGW engineer, for their fine work."

Steam Locomotive Research Scholarships Are Available

Applications are being accepted from sons of railroad families for the Steam Locomotive Research Institute scholarships at the Stevens Institute of Technology. Candidates must have the necessary scholastic qualifications for admission to Stevens, then must prove their need for financial assistance. The scholarships were established in September 1952 with funds remaining after dissolution of the research institute.

Any Old Railway Ages?

Watch for surprise announcement about prizes for finders of the oldest copies of affiliated *Railway Age*, the weekly which is soon to celebrate 100 years of continuous publication.

Look also for titles *Railroad Gazette* (before 1908) and *Western Railroad Gazette* (before 1870).

There may be gold in that odd corner.

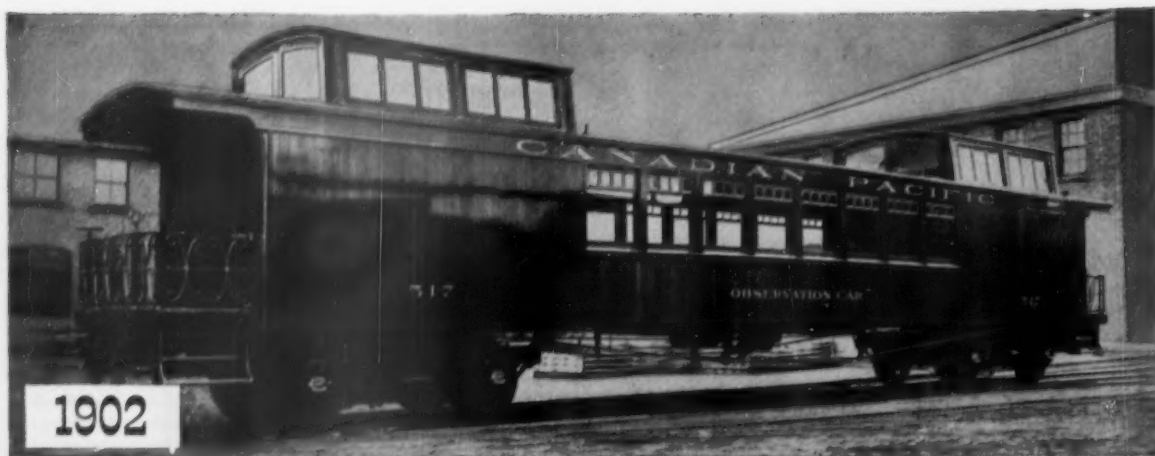
P. F. E. Steps Up Its Safety Efforts

By intensive efforts in accident prevention, the Pacific Fruit Express Company under the leadership of K. V. Plummer, vice-president and general manager, has achieved an outstanding cooperative result in the last few years. This is shown by the reduction in casualties per million man-hours worked from about 34 in 1947 to 22 in 1948, 13 in 1949 and then more slowly to a record low of 3.11 in 1954.

A clearer picture of what has been accomplished is afforded by consideration of the widespread nature of P.F.E. activities which include work in 7 off-line districts, 3 districts in platforms, 17 in plants, 6 major car repair shops, 3 light repair stations, six material stores, construction forces, etc. The official record shows a total of 41 reportable injuries in 13,176,488 man-hours worked during 1954 which gives the figure 3.11 casualties per million man hours as mentioned.

In recognition of especially meritorious efforts in accident prevention, Pacific Fruit Express officers have recently visited all major P.F.E. points and awarded safety plaques to the various departments which

(Continued on page 94)



Practical and popular. Car No. 517 was an immediate success when put into service by the Canadian Pacific Railway in 1902. The road is adding 36 sleekly beautiful stainless steel dome cars to its fleet. The Budd Company of Philadelphia, Pa., has produced over 2250 all-stainless steel passenger cars, including scenic dome types.

How "new" is the Scenic Dome car?

Not quite so new as you might think! Some long-forgotten genius—probably inspired by the cupola carried on cabooses — conceived the scenic dome passenger car about 1900.

The first model was an elegant creation of solid mahogany and gold leaf. But compare it with today's deluxe streamliner, built of chromium-nickel stainless steel.

Old No. 517 rolled out of the Canadian Pacific shop in 1902 — it had to be scrapped in 1913, after a life of only 11 years. By contrast, modern all-stain-

less steel passenger cars have given over 20 years of daily service and still show no signs of deterioration.

The high strength-weight ratio of properly designed cars of nickel-bearing stainless steel permits substantial reductions of bulk and deadweight — *without any sacrifice of strength or safety.* What's more, stainless steel containing nickel effectively resists the corrosive conditions met in everyday railroading.

The use of nickel-bearing stainless steel in railway cars is just one more

proof of the value of nickel as an alloying agent. In general, nickel strengthens and toughens other metals and imparts to them added corrosion-resistance.

If you have a problem in which corrosion, high or low temperatures, stresses or fatigue are troublesome factors, let's talk it over. Two minds are always better than one, and we may be able to help you find out how nickel or a nickel alloy can solve a troublesome problem for you.

Write for . . . List A of available publications. A simple form makes it easy for you to outline your problem.



Nickel Alloys Perform Better Longer

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
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NEW, LIGHTER,
more powerful...



This NEW $\frac{1}{2}$ " Drill has the power for heavy duty work. It's shown here equipped with diamond drill going through the high carbon steel of a bumper. Side handle is movable. It's Model No. 1498!



ELECTRIC DRILLS



Carbon comes out of combustion chambers in a hurry with this NEW $\frac{1}{4}$ " Drill shown here equipped with wire brush. It's lightweight, compact, ideal for mechanics' tool kits. Ask for the NEW Sioux Model No. 1475!



There's an answer for those hard to get at places in automotive, aircraft, and industrial work—it's the popular Sioux $\frac{1}{4}$ " all-angle Drill, designed especially for working in close quarters.



Use
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for running repairs
**The G. N.
BRAKE BEAM
safety support**

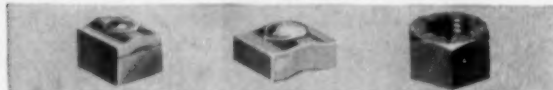
**gives extra safety
in the brake
danger-zone!**

The G. N. Brake Beam Safety Support, through sound engineering, dependable performance and easy installation, can prevent a derail due to brake beam or brake hanger failure.

- THE COMPRESSION AND TENSION MEMBER CONNECTING BRACKET ASSURES PROPER LOCATION OF SUPPORT AT TIME OF APPLICATION AND IN SERVICE.
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- Easy to apply on loaded or empty cars—NO NEED TO JACK CAR OR REMOVE TRUCKS.
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- Attaches to brake beam only.
- To remove brake beam, only one side of support need be detached.
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Compare all railroad batteries . . . recognize why the EH Exide-Ironclad is a new standard for railroad car lighting and air conditioning.

Our standards are higher . . . the new EH Exide-Ironclad delivers 100% capacity initially—not 85%. Uniform quality assures sustained high capacity during longer useful life.

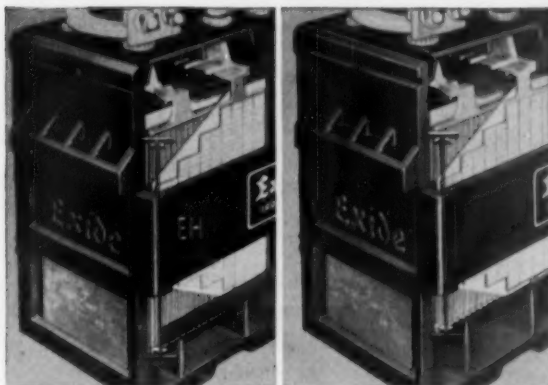
You get a new kind of a high capacity battery when you buy the EH Exide-Ironclad *plus* these Exide-Ironclad exclusive features:

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- Slotted tube construction of the Ironclad Positive plate, permanently sealed on the bottom with polyethylene tube sealer. More active material is exposed to the electrolyte, resulting in greater power. More active material is retained, providing higher battery capacity for a longer working life.

New engineering designs toward simplification and new modern manufacturing facilities assure high, uniform quality.

Write for specifications of this new standard for railway battery performance.

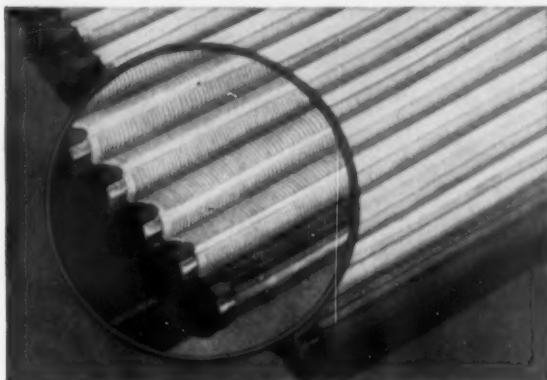
Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.



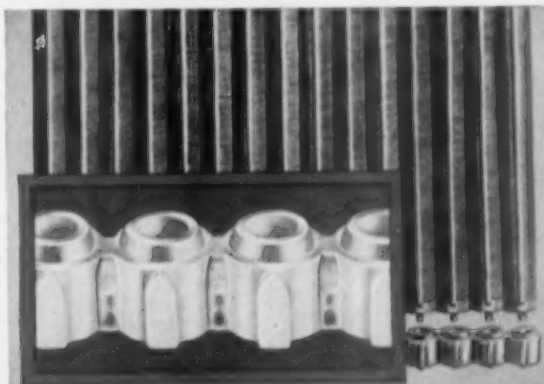
10% LONGER PLATES—10% more active material in the same space for a new kind of high capacity battery performance . . . new positive plates balanced with new stable voltage negative plates for full rated power initially . . . full rated power sustained for a longer working life.



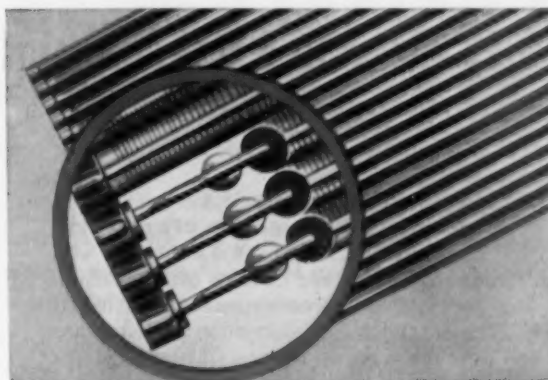
QUALITY CONTROL — continuous research . . . simplification of the design . . . new manufacturing techniques in casting and blending . . . more certain controls of production . . . result in high, uniform quality.



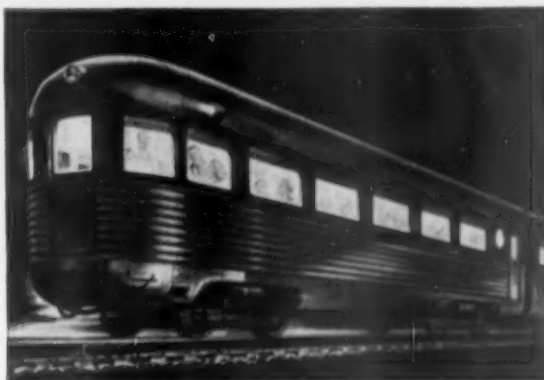
POLYETHYLENE SLOTTED TUBES—the non-oxidizing plastic tubes which retain active material in contact with the grid spine, yet permit the electrolyte to penetrate throughout the active material.



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The Airco 9000 series hand cutting torches are designed to make short work of jobs in scrap cutting, rivet washing and general maintenance.

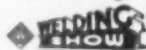
Here's flexibility at its finest. Torches range from the 13-inch length for working in confined areas to the 72-inch length for keeping heat and fumes at a distance and include the standard 21-inch model. Torch heads are available with 45°, 75°, 90° and straight heads—your choice of monel or bronze.

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nesses from sheet metal up to 12" steel. Tips are available for cutting with acetylene, propane, or natural gas.

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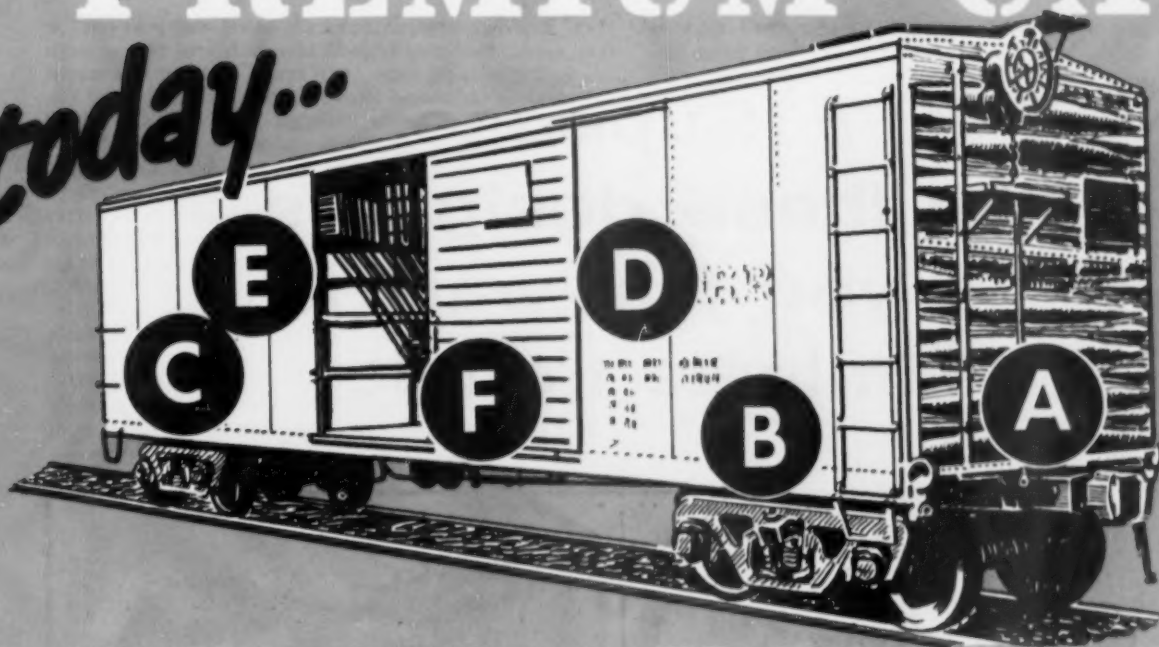
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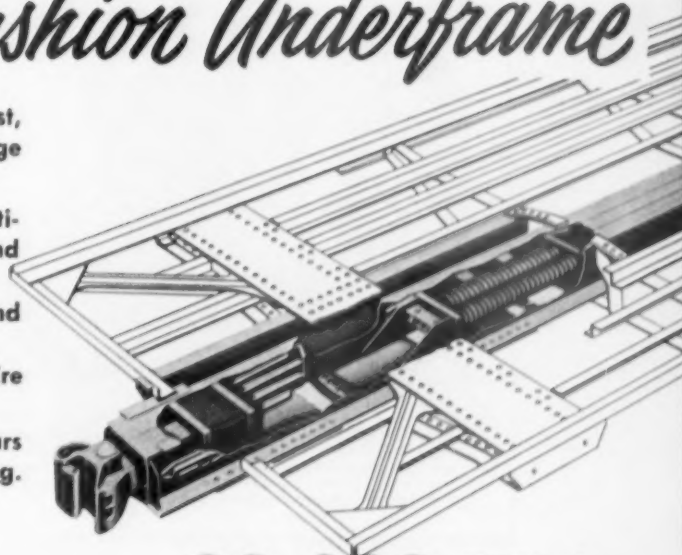
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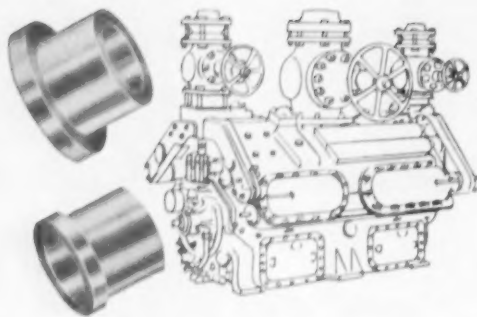
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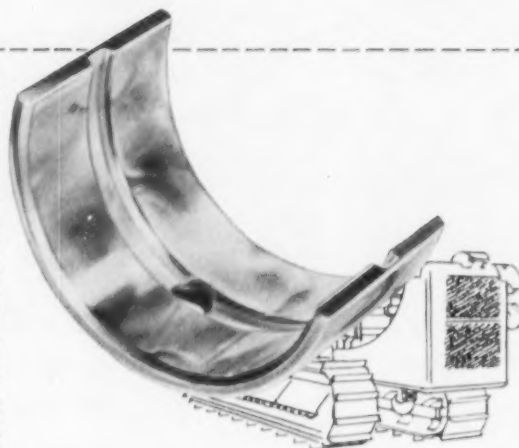
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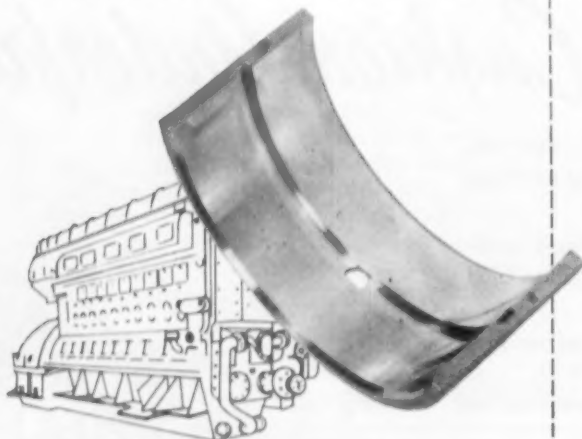
Suppose, like these designers, you just want to eliminate trouble



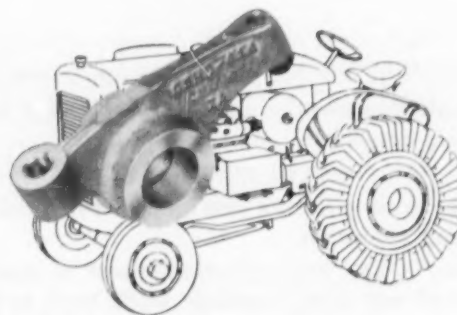
YORK CORP.—use sleeve-type load and thrust bearings of cast aluminum alloy that last 20,000 hours and more. They solve service problems, carry heavier loads, are easier to machine, prevent shaft damage.



CATERPILLAR TRACTOR CO.—use solid aluminum for main connecting rod and thrust bearings in their tractor. In addition to longer life, the solid aluminum bearings showed a much lower percentage of failures than previously used materials.



FAIRBANKS, MORSE & CO.—switched from steel-backed or bronze-backed babbit to solid aluminum for crankshaft bearings. They report an increase of at least 10 times in bearing life, with added advantages of corrosion resistance, freedom from shaft damage and reduced rotating weight.



SCHRAMM, INC.—use an entire rocker arm cast of Alcoa Aluminum bearing alloy. They avoid costly forging dies for steel arms and costly machining necessary for conventional bushing inserts.

● There were three points in manufacturing history when designers could have demanded 24-carat gold for bearings. It happened once during World War I, when the Liberty Engine was born. Again when the Luftwaffe became the scourge of World War II skies. It happened when Rolls Royce built their Bentley automobile for millionaires.

What did these designers use when they could have demanded anything? ALUMINUM. And because of their early conviction that aluminum was the finest bearing material obtainable, scores of companies today are switching to solid aluminum bearings.

What do they get from aluminum that neither babbitt nor bronze nor any multimetallic combination offers? *No bond problems.* One-piece aluminum bearings *take tremendous loads* without failure.

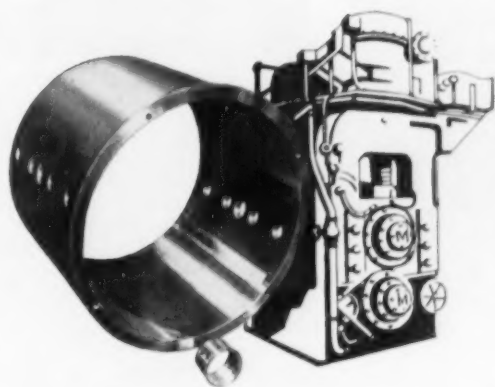
Where additive oils are used, these engineers specify aluminum, knowing its *natural corrosion resistance* protects them. Where hot spots are likely, they know aluminum's *swift thermal conductivity* lessens seizures. Where dirt is a problem,

they know aluminum *embeds particles* almost as well as babbitt—far better than bronze.

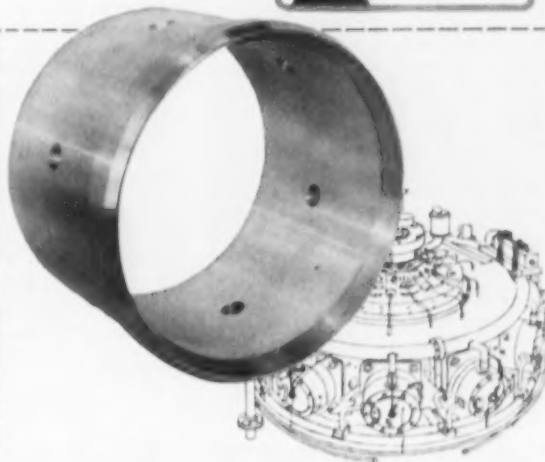
Who will be next to quadruple the life of his bearings? It could be the man who fills out the coupon below.

ALUMINUM COMPANY OF AMERICA
1986-E Alcoa Building, Mellon Square, Pittsburgh 19, Pa.
Gentlemen: I would like to discuss aluminum bearings with an Alcoa sales engineer.
Name _____ Title _____
Company _____
Street and Number _____
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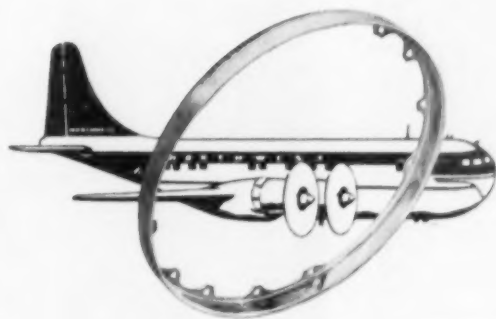
Your Guide To Aluminum Value



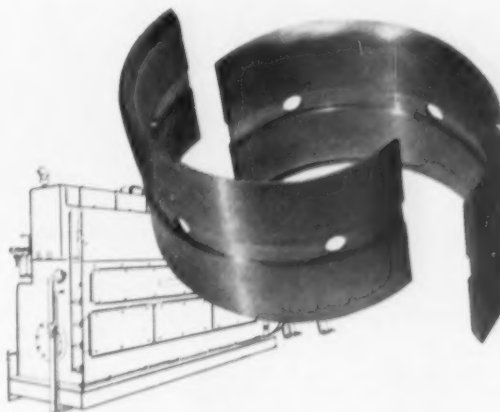
MORGAN CONSTR. CO.—use solid aluminum for their Morgoil Roll Neck Bearings in rolling mills. They report longer life than previously used steel-backed cadmium bearings, better corrosion resistance, better performance at high and low speeds on both hot and cold mills.



NORDBERG MFG. CO.—use full, round, solid bushings of Alcoa® Aluminum. They prove far superior to babbitt—give longer life—lessen maintenance interruption. Over 20,000 operating hours without failure.

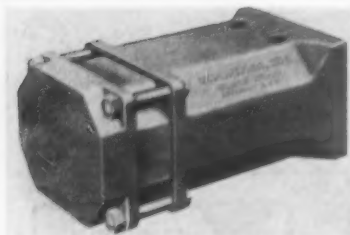


PRATT & WHITNEY—needed a bearing material to withstand the sliding action of steel on their cam bearing. They used a solid aluminum bearing with excellent scuff resistance—saved 65 per cent weight—got better bearing performance.



INGERSOLL-RAND CO.—specified full floating bearings of solid Alcoa Aluminum for main connecting rod and thrust bearings. Results: longer life and lower cost than steel-backed babbitt, no spoiled crankshafts.

EQUIPMENT...New Ideas—New Uses



Rubber Draft Gear For Cars and Locomotives

The Miner Class FR-16 rubber draft gear recently awarded AAR Certificate No. 26, is designed with sufficient initial compression to fill the gear pocket or yoke tightly for any plus variations. This initial compression insures permanence of positive initial action, thereby guaranteeing superior durability which is primarily related to tight attachments that will result in reduced wear on coupler carriers and draft keys. The FR-16 incorporating the Miner technique insures a compression action which produces 25 per cent of its total capacity at half travel. Thus, the gear

possesses what Miner feels to be the cushioning efficiency of any type draft gear, and that is the gear shall compress with such a rate of increase in resistance as will cause the lowest practical ultimate force in pounds. It is evident that the Miner FR-16 with positive initial action will have much less final load in pounds than a gear which does not possess 25 per cent capacity at half travel.

The FR-16 is designed for application to the 2 1/4-in. pocket and utilizes standard draft attachments. The gear is fully enclosed and self-contained. It can, therefore, be applied within the standard yoke and to the car at any railroad shop. Prior to shipment, the gear is reduced in length by the use of aluminum inserts placed underneath the heads of the four bolts, thereby permitting easy application to the draft gear pocket. No special tools or procedures are required to install the device.

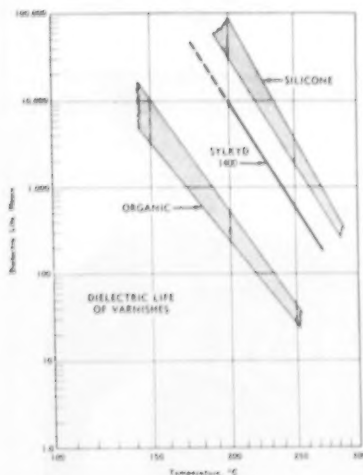
AAR laboratory tests showed the gear to have a capacity of 39,400 ft lb at 2 1/4 in. travel. These results are realized with a maximum reaction of 475,000 lb, which is 10 per cent lower than the 525,000 lb column strength of a Type E coupler. *W. H. Miner, Inc., 209 South La Salle street, Chicago 4.*



Portable Generator

This device has been designed to furnish temporary or emergency sources of electric power. It is light in weight, yet it puts out 1,500 watts of electricity, enough to operate small tools, floodlights, electric pumps or other similar electrical equipment.

A 4-cycle, direct-drive, 3-hp gasoline engine runs the generator. It is equipped with an automatic rewind starter and has two built-in sockets. Units for d-c supply weigh 97 lb while a-c units weigh 107 lb. *Master Vibrator Company, 262 Stanley avenue, Dayton, Ohio.*



Impregnating Varnish

A modified silicone dipping and impregnating varnish, identified as Sylkyd 1400, increases the durability of electrical equipment insulated with Class B components. The formulation combines good heat stability with excellent bond strength and resistance to moisture, oil and solvents.

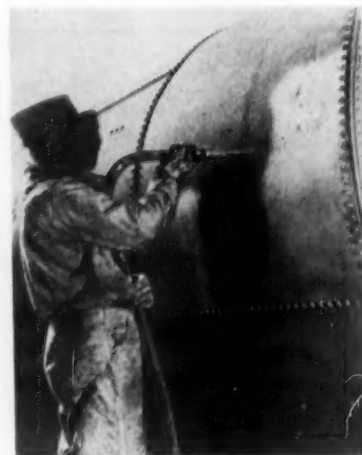
The manufacturer claims that the product has an insulating life expectancy of 25 to 50 times that of good organic var-

nishes at the Class B hottest temperature of 130 deg C. Not intended for use at Class H temperatures, it will stand up at temperatures in the range of 180 to 200 deg C for short intervals.

Bond strength at all service temperatures equals or exceeds organic varnishes, and is second only to the most specialized dielectric coatings. These properties make the formulation adaptable to railroad traction motors and other heavy duty equipment which carry frequent overloads and must be periodically cleaned for inspection and performance checking. *Dow Corning Corporation, Midland, Mich.*

Corrosion Inhibitors

Two new types of corrosion inhibitors, CI-103 and CI-104, are effective both on ferrous and non-ferrous metals. Type CI-103 is a film-former which dries tack-free in three to four minutes. It may be removed by a simple aromatic petroleum solvent wash. Type CI-104, neither a coating nor a film-former, leaves an extraordinary durable deposit of mono-molecular dimension as a moisture barrier on treated surfaces. Developed by *Princeton Paint Laboratories* and available from *John B. Moore Corporation, P. O. Box 3, Nutley 10, N. J.*



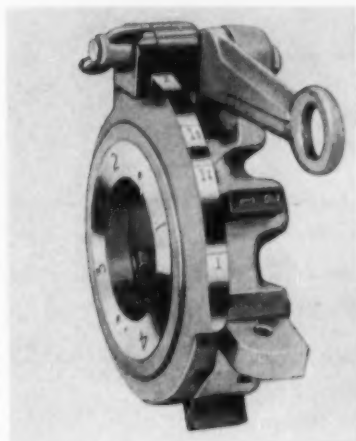
Mineral Shot Blast

Mono-Kleen, a spherical non-metallic mineral shot, cleans uniformly in one pass with no dust clouding the operator's vision and leaving the surface free of grime, film and

dust. It is said to permit substantial savings in production time, material cost, and blasting-equipment maintenance, as compared with sand and metallic shot.

The spherical characteristic of the shot reduces wear on the mixing chambers, hoses and nozzles of the blasting equipment. It requires a lower impact velocity and blasting pressure, therefore, reduced power costs are obtained. The shot can be reclaimed and reprocessed for use again.

The product, containing only 0.1 per cent free silica, constitutes no health hazard. It is chemically inert in the presence of moisture and will not discolor metallic or non-metallic surfaces. It is available in two types: Type S for heavy duty use in foundries and general blast cleaning, and Type F for fine finishing of precision metal parts, glass and other materials. Both are shipped in bulk or in 100 lb multiwall paper bags. *Baldwin-Hill Company, Trenton, N. J.*



Die Head

When the Quadra-Type die head is set in position it will thread graduation easily and accurately and will not slip. It threads pipe or bolt in 1-, 1¼-, 1½- and 2-in. sizes. Thread after thread can be cut without resetting. The unit is fully adjustable to cut standard, and over or under standard threads.

Die numbers are deeply and clearly marked by a special engraving process. Die set numbers are easily read, even though oil film or dim light. The unit is constructed for long wear and has a quick-opening throw-out. It has die segments 1½ in. wide to insure a perfect standard length thread. *Beaver Pipe Tools, Inc., Warren, Ohio.*

Micrometer and Grinding Fixture

A micrometer grinding fixture for setting the proper offset when sharpening circular form tools used in automatic screw machines and recessing tools is designed for



use on any toolroom surface grinder having a magnetic chuck, or for bolting to the table on universal type grinders.

The manufacturer claims that the fixture allows easier setup for grinding and measuring face offset; closer control over tool diameters and angles for accurate work; and consistent reproduction of flat cutting faces, parallel to center line and square with the sides. After sharpening, the cutter may be set in the machine or recessing tool and used without further checking by out-and-try methods.

Interchangeable adapters are available for correct mounting of various type cutters. *Scully-Jones & Co., 1901 South Rockwell street, Chicago 8.*

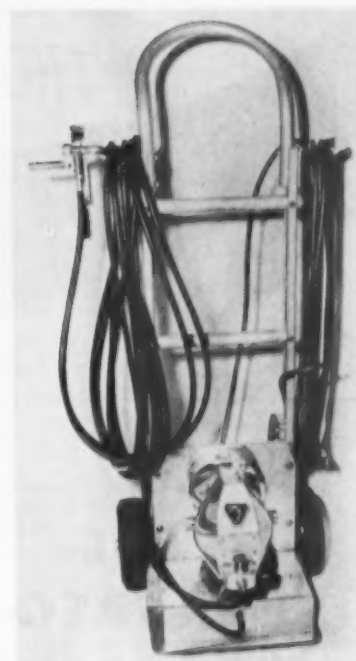


Rectifier Welder

This welder, equipped with a five-range control switch, provides coarse adjustment with generous overlap between ranges to permit dual control. Its rheostat, which can be removed for remote control, gives continuous control by adjusting the direct current through the control coils. These controls yield a wide welding current range of 35 to 425 amp for use with a variety of electrode sizes for repair, maintenance and production welding.

A welding core of electrical steel and

the absence of moving iron core or adjustable air gaps, assure quiet operation. For easy handling by crane or hoist, a lifting eye is provided. The unit can also be supplied with portable mounting. *Hobart Brothers Company, Hobart Square, Troy, Ohio.*



Industrial Radiography

The Iridium Isotron allows sources of up to 75 curies to be exposed at distances of up to 50 ft from the operator, who can expose the source while remaining behind a concrete wall or personnel shield. It was specifically designed for the remote handling of Iridium 192 in industrial radiography.

The device can be utilized for the kind of shots that cannot be handled conveniently with X-ray equipment. For example, panoramic exposures where several specimens are arranged around the source and shot simultaneously, and internal exposures where the source is exposed within a cavity in the specimen and the film is wrapped around the outside.

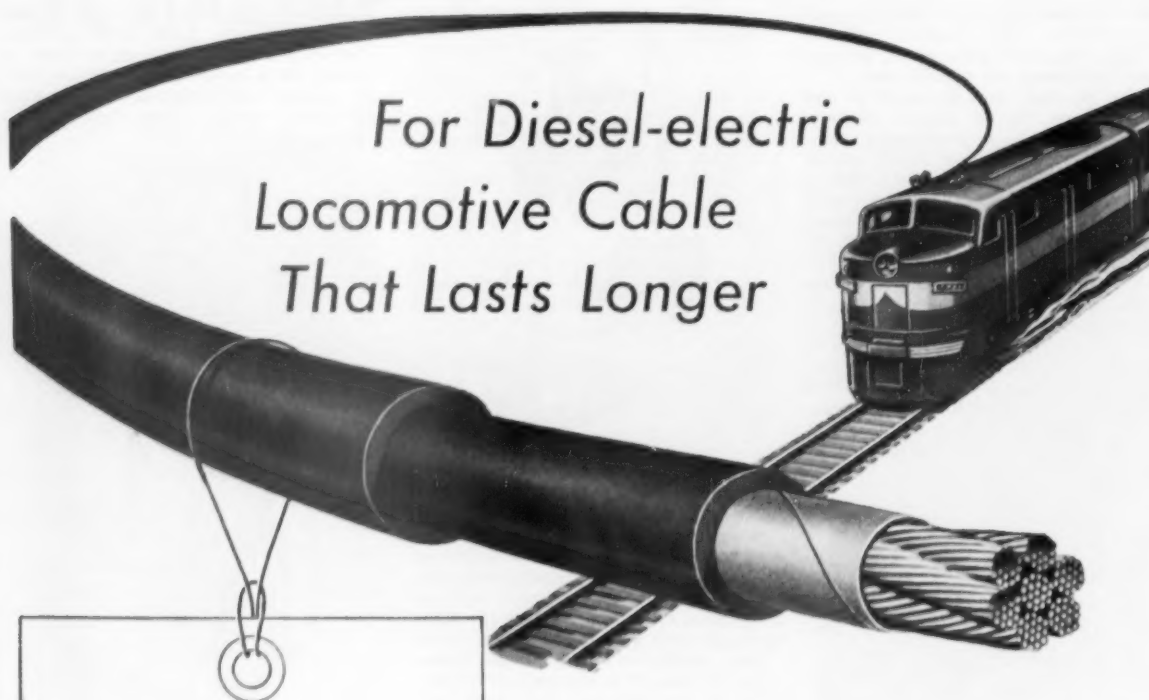
The Isotron is completely portable, requires no power and weighs only 125 lb. Exposure times comparable with those for X-ray equipment are obtainable. It has greater sensitivity, and still retains nearly the range and latitude of Cobalt 60. *Gamma Corporation, Mansfield, Mass.*

Optical Straightedge

A beam of light, interrupted by the inscribed reticle of a precision feeler microscope, measures deviations as small as 0.000025 in. on flat surfaces up to 20 in.

(Continued on page 26)

For Diesel-electric Locomotive Cable That Lasts Longer



G-E VERSATOL GEOPRENE resists —

- FLYING GRIT AND SAND
- OIL
- WATER
- CLEANING COMPOUNDS
- LIVE STEAM
- ICE DAMAGE

G-E Versatol* Geoprene* cable has a neoprene-base jacket that resists flying dust, grit, and sand. It withstands oil, water, cleaning compounds, live steam, and ice. The extra-flexible rope stranding is designed to stand up under continuous flexing.

Fine stranding makes this cable extremely easy to handle and to pull through conduit. Insulation strips cleanly. The carefully controlled diameter and concentricity of the cable provide a proper fit at all bushings and terminals.

G-E Versatol Geoprene cable is immediately available from stock in sizes No. 14 Awg and larger for power circuits (1000-volt rating); in sizes No. 16 and 14 Awg for control circuits (300-volt rating); and for general-purpose wiring. Control cable has rating printed on the surface for easy identification.

*Registered Trade-mark General Electric Company

Technical Information available

Special high-temperature G-E cables are available for use in high-heat areas. For complete information, general purpose or special application, write for specification booklet "G-E Diesel-electric Locomotive Cables." Section W159-547, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



Progress Is Our Most Important Product

GENERAL ELECTRIC

FRISCO

The Frisco is one of the progressive railroads now testing the Griffin EQS.

Roundness of EQS wheel is practically perfect—as-cast. No machining necessary... the toughest and longest-wearing metal is *on the tread, NOT in the scrap bin.*

Pressure pouring in graphite molds results in superior flange and tread wear. Note the directional solidification in flange and tread, shown before heat treatment: *the grain of the metal in EQS wheels is at right angles to the point of wear.*

Long sweeping fillets under flange and rim of EQS wheels insure greatest possible strength.

The Griffin EQS plate is of *uniform thickness*, dimensionally accurate in any section.

Now made of .75 carbon steel. Exclusive casting process used in producing EQS wheels permits use of recognized steel analysis that will best meet your requirements.

Only one wheel can pass
this test with a score of

100—

Location of hub and plate is identical in all EQS wheels; dissipation of heat is even, without developing internal stress.



GRIFFIN EQS
ELECTRIC QUALITY STEEL

GRIFFIN WHEEL COMPANY
445 N. Sacramento Blvd., Chicago 12
GRIFFIN STEEL FOUNDRIES LTD.
St. Hyacinthe, Quebec, Canada

Give the "green" to GRIFFIN...
and watch your costs go down!



EQUIPMENT...New Ideas—New Uses



long. According to the manufacturer, it provides accuracy of measurement to smaller-scale machining or polishing operations.

A prism-and-lens housing, resting on two metal blocks over the work, permits the feeler microscope with its built-in illumination to ride along the surface under examination. Deviations observed through the microscope are indicated by the relative position of two indices and are converted into linear measurement by reference to a micrometer thimble.

This optical straightedge can be used in checking surface deviations in machine tool tables, surface plates, flat beds, slide-ways, cylinders, etc. *F. T. Griswold Manufacturing Co., 305 W. Lancaster Avenue, Wayne, Pa.*



Storage Battery

This plastic-cased battery, the 3-COE-7 Tytex, is for emergency lighting. Eight to twelve years of useful life is anticipated for the unit according to its manufacturer. Pasted type positive plates of 1/4 in. thickness and active material of special

formulation contribute to this long life. Negative plates of heavy, rugged construction are in balance with the positive plate characteristics.

Short circuits, one cause of failure in control circuit batteries, are prevented by triple insulation with inert plastic and rubber. Polystyrene, a clear, heat-resistant plastic, was selected for the container and cover.

State of charge is indicated by colored pilot balls floating in a vertical channel molded into one corner of the container. The battery requires addition of water only once or twice a year under normal circumstances. The device, available in several capacities and container styles, is supplied filled with electrolyte and charged for immediate service, charged and dry, and uncharged and dry. *Exide Industrial Division, Electric Storage Battery Company, Box 8109, Philadelphia 1.*



Dry Abrasive Cutting Machine

Available in both stationary and portable types, this dry-abrasive cutting machine is capable of a speed of approximately 3 seconds per sq in. of material being cut.

Known as Model No 28 SeverAll, the unit was designed to handle material up to 4 in. square at 90 degree to axis for solid steel and 8 in. at 90 degree to axis for channels. These specifications are based on using an 18 in. cutting wheel with a 10 hp motor.

Being an oscillating type device, the amount of abrasive wheel contact is reduced and cutting is performed with a minimum of pressure on the abrasive wheel. A double-acting work holder automatically positions the material in line with the center of the wheel. The material is then clamped at both sides of the cutting wheel by a hand-operated crank handle.

The device stands 62 in. high, is 32 in. wide and 56 in. deep. It weighs 750 lb stripped and 950 lb with its electrical equipment. The portable model can be

moved through the use of four wheels. *Campbell Machine Division, American Chain & Cable Company, Inc., 929 Connecticut Ave., Bridgeport 2, Conn.*



Insulation Resistance Tester

This tester can be useful in several kinds of preventive maintenance tests, particularly in testing circuit breaker bushings, and in making time-resistance or dielectric-absorption checks on apparatus which has relatively high 10 minute insulation resistance values.

The device, a rectifier-operated Megger, can be used where a number of tests are to be made in one location, as in testing separate conductors or cables, where high resistance values are indicated continuously and as a convenient source of direct current at a relatively high voltage.

There are two models available, one having a range up to 100,000 megohms at 5,000 volts with 1,000 and 2,500 volt intermediate ranges, and the other having a range up to 200,000 megohms at 10,000 volts with no intermediate voltage ranges.

The d-c power supplies for both units include conservatively rated selenium rectifiers and constant voltage transformers. Moving systems of the units are equipped with vibrators to reduce pivot to jewel friction so that high sensitivity can be achieved. *James G. Biddle Company, 1316 Arch Street, Philadelphia 7, Pa.*

Low Hydrogen Electrode

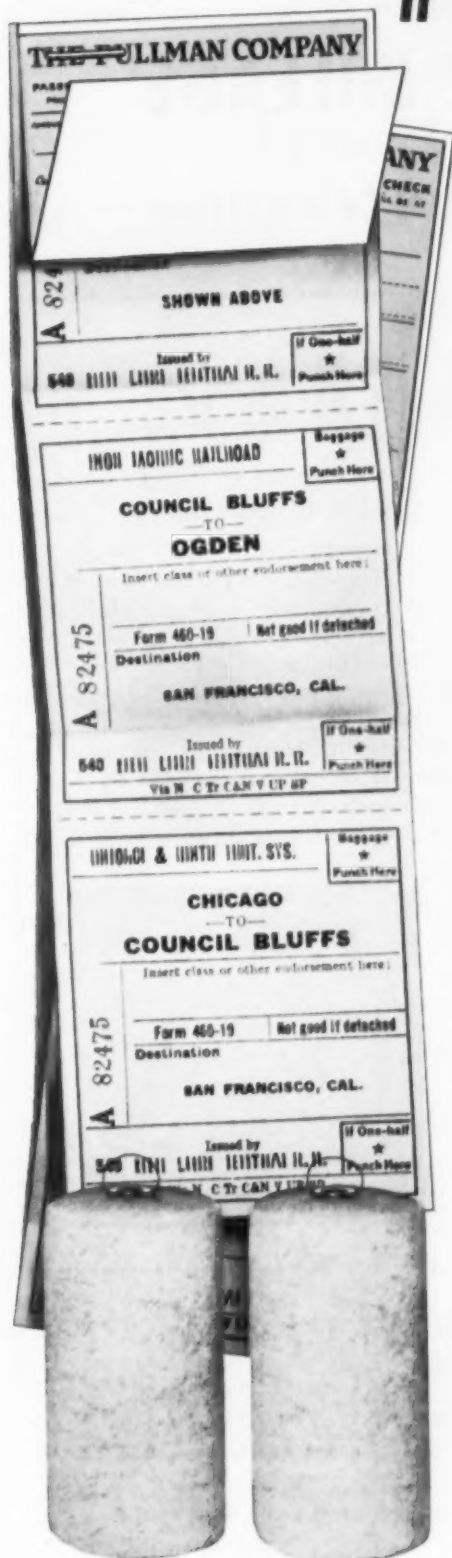
This new electrode, Strikeasy LH-1, provides faster and easier operation than conventional low-hydrogen electrodes, with excellent x-ray properties of weldments, according to the manufacturer. In a controlled test, a deposition rate of 61 per cent faster than conventional E-6016 electrodes was realized.

Powdered metal which has been added to the coating contributes to the weld making

(Continued on page 86)

TICKETS and OIL FILTER CARTRIDGES

It Takes More Than a Quick Look to Tell How Far They'll Go!



A quick look at a railroad ticket may represent the difference between Portland, Ore., and Portland, Me. Judging Oil Filter Cartridges by appearances can be equally misleading—but here it's dollars instead of miles.

The value of an Oil Filter Cartridge lies hidden in such things as engineering, design, formula, craftsmanship and "know-how". WIX Engineered Filtration with electronic control of density and technical supervision of every step in construction pays off in PERFORMANCE.



A recent laboratory test of a WIX lube oil cartridge versus 3 other makes exposed this dramatic difference in performance.

Whether your problem is for fuel or lubricating oil filtration on yard, freight, passenger engines or maintenance-of-way equipment, you'll find the sound, economical, trouble-free answer in WIX Engineered Filtration.

Get the facts—write for catalog and full information today.

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OIL FILTERS CARTRIDGES
WIX CORPORATION • GASTONIA • N.C.

WAREHOUSES
 DES MOINES GASTONIA ST. LOUIS NEW YORK SACRAMENTO

Precision Parts by **MAGNUS**

mean **LONGER, SAFER MILEAGE**

for Diesel Locomotives



- Perfectly mated bearing halves
- Heat-resistant Satco lining metal
- Interchangeable double keeway
- Available for all makes and types of diesel-electrics

High Mileage

traction motor support bearings
for **LONGER ROAD LIFE**

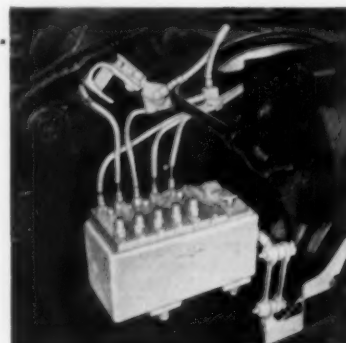
The extra precision that goes into Magnus traction motor support bearings pays off in longer, trouble-free mileage on the road. Quality control of metal mixes, high precision boring and final testing of mated bearing halves *under load* assure an extra margin of dependability — you can't buy a better bearing.

These Magnus HIGH-MILEAGE bearings are available for replacement on all types and makes of diesel-electric and electric locomotives and MU cars. For the complete facts, get your free copy of Bulletin No. 6000.

**D-16 FLANGE LUBRICATOR increases mileage
between wheel turnings up to 40%**

This new, more positive method of flange lubrication not only gives greatly extended wheel life, but substantially reduces shop costs, too. Oil pressure to each flange is positively controlled by six individually adjustable pumps that are gang-operated

from a common linkage to the truck frame. Unit operates only when locomotive is moving. Can be used to lubricate center pin wear plate also, if desired. Full 16-pint capacity for extra mileage between refills. Write for complete information.



MAGNUS 391 SAFETY VALVE
for dependable overload protection
on diesel locomotive steam generators

This high-precision safety valve is specially made for railroad service on diesel locomotive steam generators. Opening and blowdown pressure adjustments are easily accessible and self-locking. Flexible metallic bellows prevent escape of steam into the generator compartment. Write for full details.

MAGNUS

Metal Corporation

subsidiary of

NATIONAL LEAD COMPANY

111 Broadway,
New York 6, N. Y.

80 E. Jackson Blvd.,
Chicago 4, Ill.

**IN MODERN
RAILROADS...**



WATSON-STILLMAN SOCKET-WELDING FITTINGS...



Prevent Pipe Failures ... And They're Easy to Install

Watson-Stillman Forged Steel Socket-Welding Fittings provide strong, tough, trouble-free joints for air brake piping and for steam, air, oil and water lines in railroad cars, yards and shops. They're drop-forged of high quality steel for maximum resistance to shock and vibration.

Installation is easy. Just slip the fitting over the pipe and weld. The deep socket supports and aligns the pipe. No need for tack welding, backing rings or special welding fixtures. The clean, outside-the-pipe fillet weld prevents the formation of welding icicles inside the pipe. And ample "come-and-go" in the socket makes fussy accurate measurement and cutting of pipe unnecessary.

For safe, reliable service...for greater protection against costly piping failures...install Watson-Stillman Forged Steel Socket-Welding Fittings. Available for schedule 40, 80, 160 and Double-Extra Heavy pipe in sizes $\frac{1}{8}$ " to 4". Fittings include elbows, tees, crosses, couplings, air brake flanges, unions and a variety of plugs and bushings.

Write for information today.



WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey



New G-E axle-driven generators give the extra power, reliability for long, trouble-free

General Electric's new GMG-162 axle-driven motor generator has over twenty-five percent more reserve power than competitive equipment. Here's what that means:

1. Better battery record. There is enough power available to charge low batteries while the car is in operation. Therefore, fewer standby rechargings are required.

2. Should axle generators in other cars become inoperative, increased demand can be met effectively. In a recent test simulating emergency conditions, load requirements

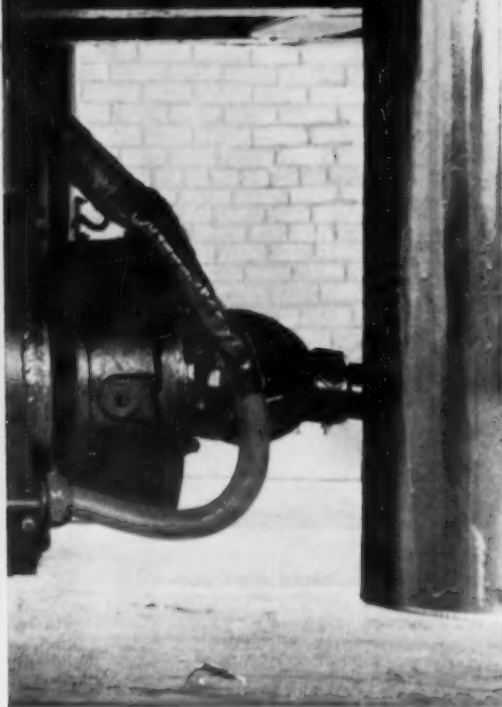
of four modern air-conditioned passenger cars were supported by *one* GMG-162.

In addition, General Electric's GMG-162 has a highly simplified control system, uses only two control panels, eliminates armature reversing switch and reduces number of moving parts. It is easy to install and to maintain. For more information contact your G-E Apparatus Sales representative. General Electric Company, Locomotive and Car Equipment Department, Erie, Pa.

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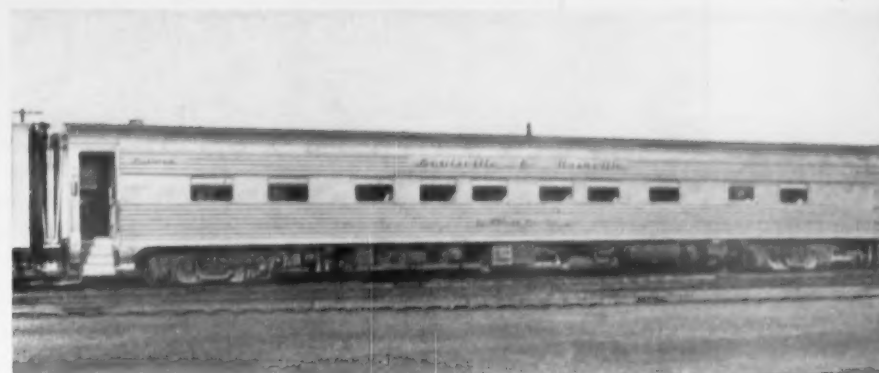
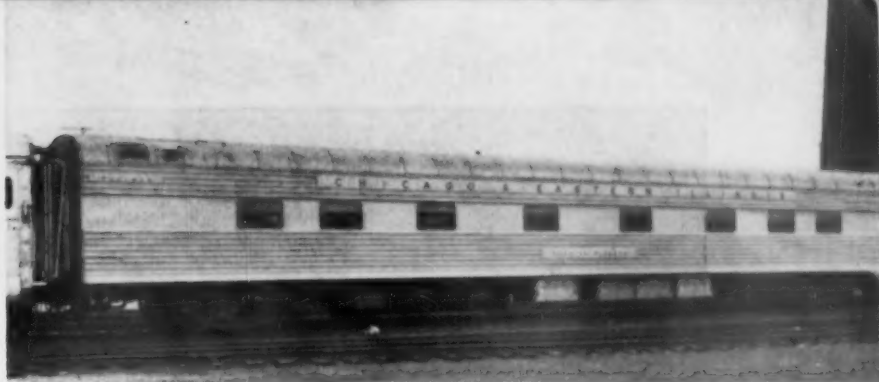
Progress Is Our Most Important Product

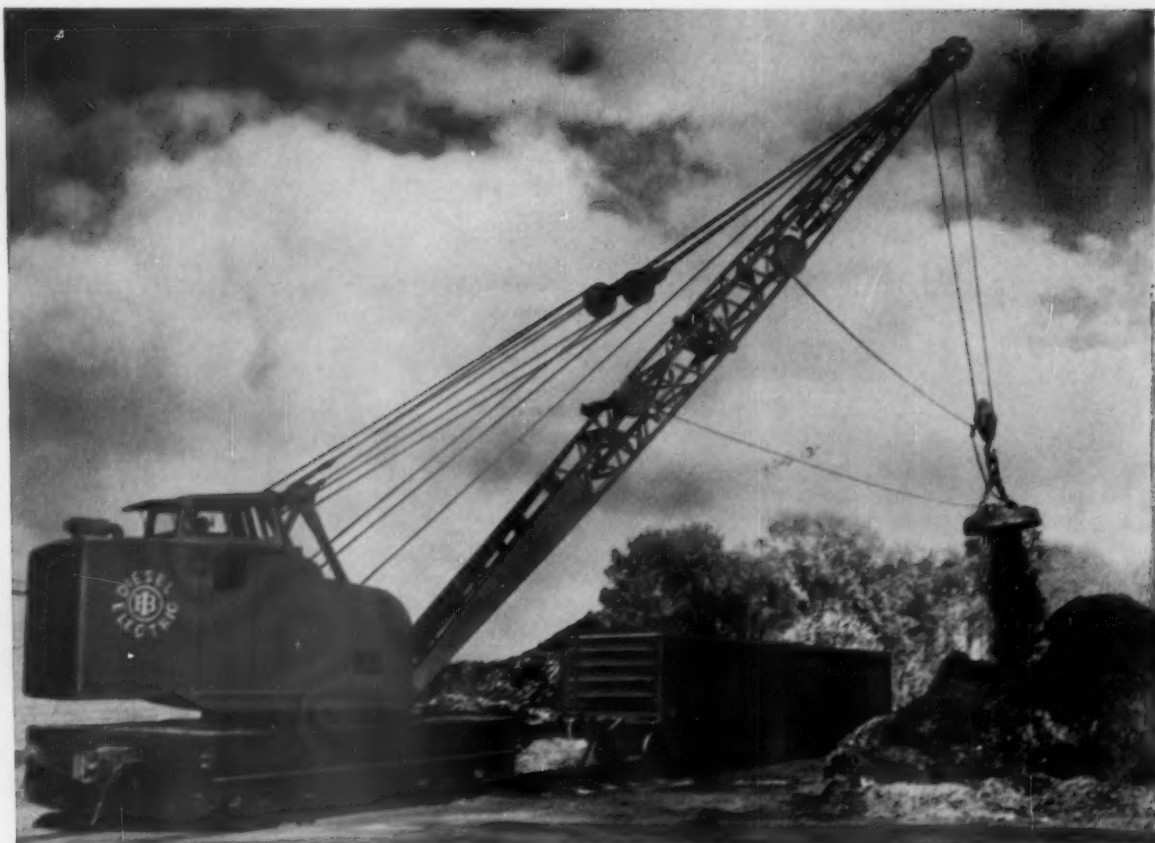
GENERAL  ELECTRIC



"Dixieland" operation

The first cars equipped with G.E.'s new GMG-162 were delivered to the Canadian National and Rock Island railroads in 1954. In the short time since then, orders have been received from: Atlantic Coast Line, Nashville, Chattanooga and St. Louis, Chicago and Eastern Illinois, Florida East Coast, Louisville and Nashville.





**With magnet
hook or bucket...
BROWNHOIST
speeds the job**

Brownhoist Cranes are helping maintain high production schedules in mines, steel mills, factories, and scrap yards . . . in fact, wherever there are railroads throughout the world. Brownhoist Diesel-Electric Locomotive-Cranes, for all their husky size, handle easily. Their patented Monitor Type Cab and Clear-Vision Boom give a 360° view. Operating controls are within easy reach. Electric travel permits operation as a switch engine as well as a crane. Constructed to last for many years with little maintenance. Brownhoist Diesel-Electric Cranes are available in capacities from 25 to 100 tons. For complete information, consult your nearest Brownhoist representative or write us today.

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BROWNHOIST

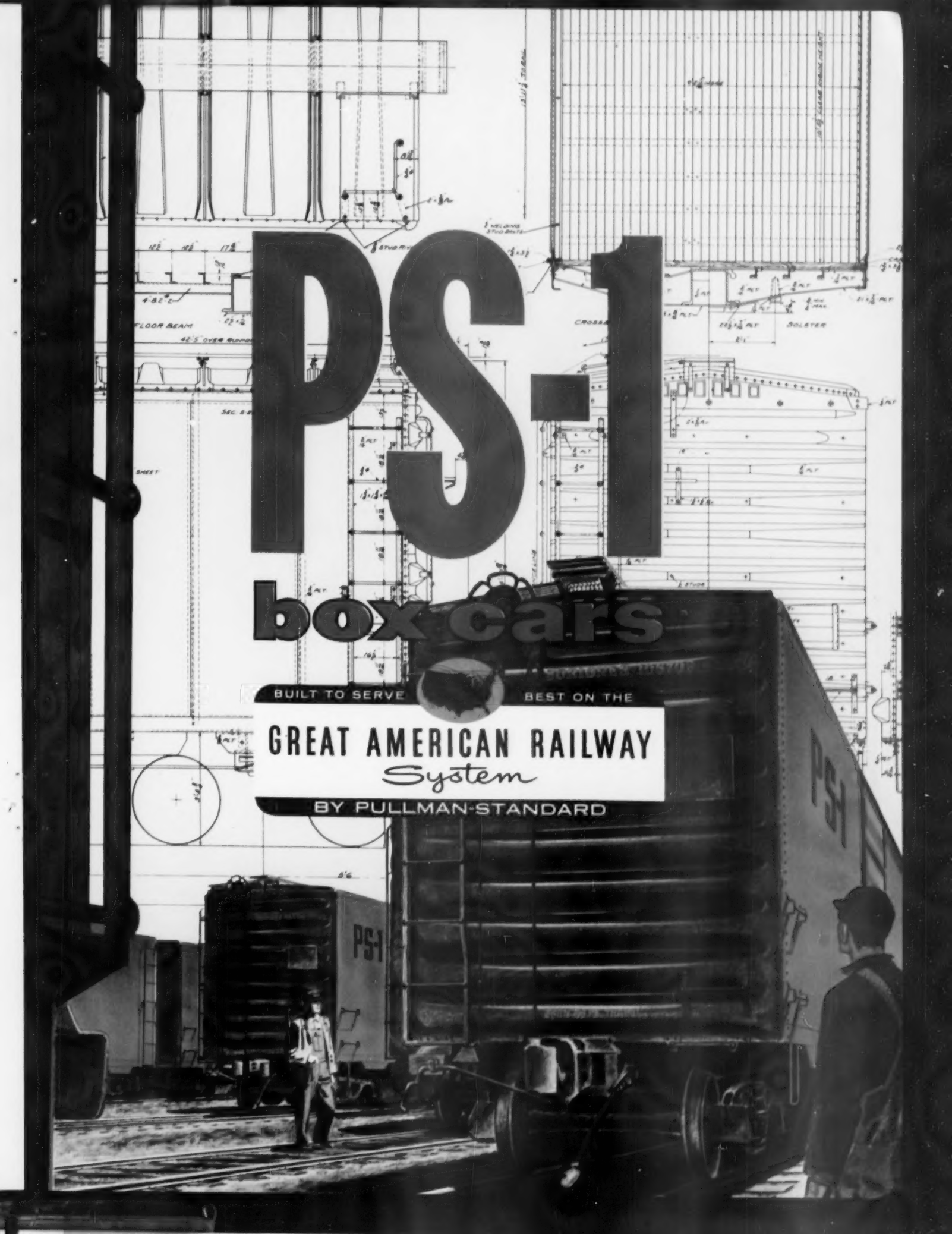
BROWNHOIST MATERIALS
HANDLING EQUIPMENT
GIVES A LIFT TO
AMERICAN INDUSTRY



SUBSIDIARY OF



INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN DISTRICT OFFICES: New York,
Washington, Pittsburgh, Cleveland, Chicago, Denver, San Francisco,
Montreal • AGENCIES: Detroit, Birmingham, Houston

The background of the advertisement is a detailed technical drawing of a box car, showing various structural components like floor beams, cross members, and rivets. The drawing is in a classic engineering style with fine lines and dimension lines.

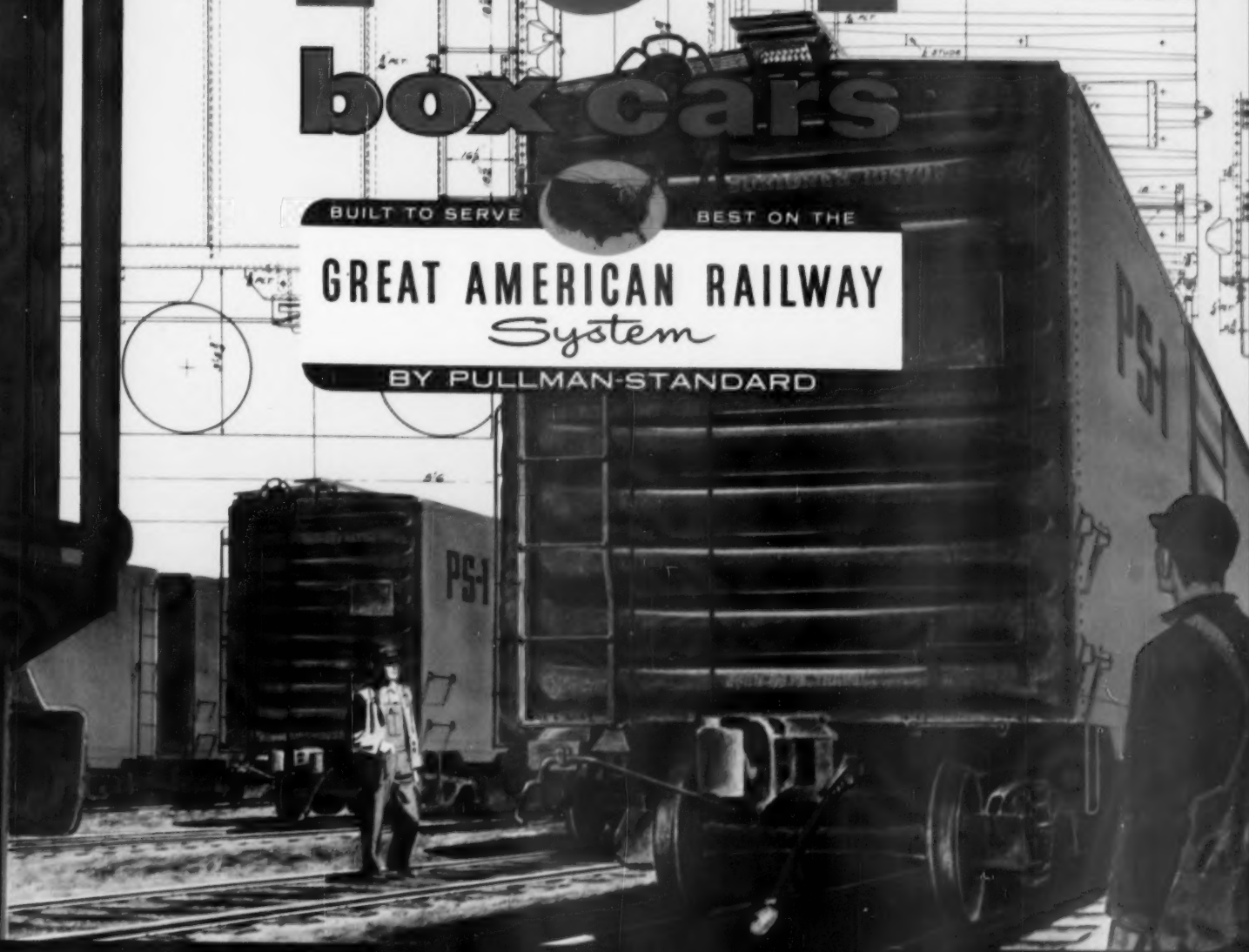
PS-1 box cars

BUILT TO SERVE

BEST ON THE

GREAT AMERICAN RAILWAY
System

BY PULLMAN-STANDARD





the PS-1



64,000*

Demonstrations of Success

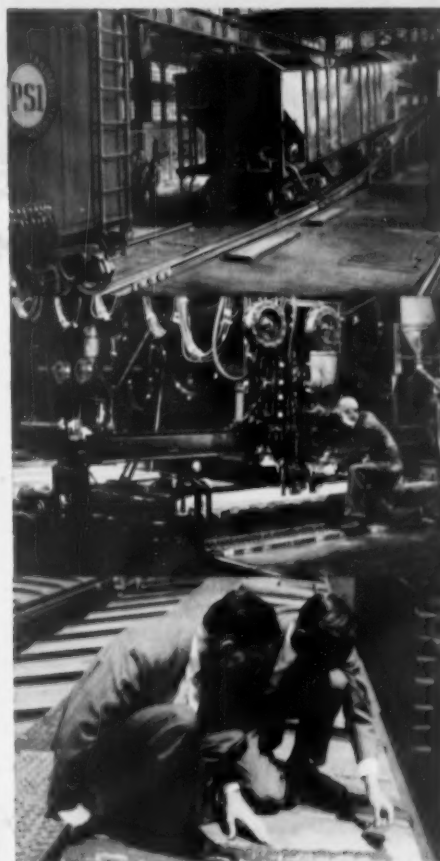
Over 64,000 PS-1 Standardized Box Cars are in service throughout the Nation. PS-1s have been purchased by 63 of America's railroads, and four departments of the Government.

The standardized PS-1 offers railroads continuous Research and Development and Engineering concentrated on a single product model. Such a costly approach could not be applied to limited production cars.

And the same principle applies to production, since specialized modern production line techniques are used to produce PS-1s.

The success of the principle of box car standardization, is individually demonstrated by each of the more than 64,000 PS-1s on The Great American Railway System.

*As of April 1, 1955



Research and Development
Pullman-Standard R&D Laboratories, the most complete in the field of carbuilding, submit PS-1s and manufacturing processes to extensive and continuous tests. If areas for improvements are revealed, all parts possibly affected by any specific weakness are carefully considered for redesign.

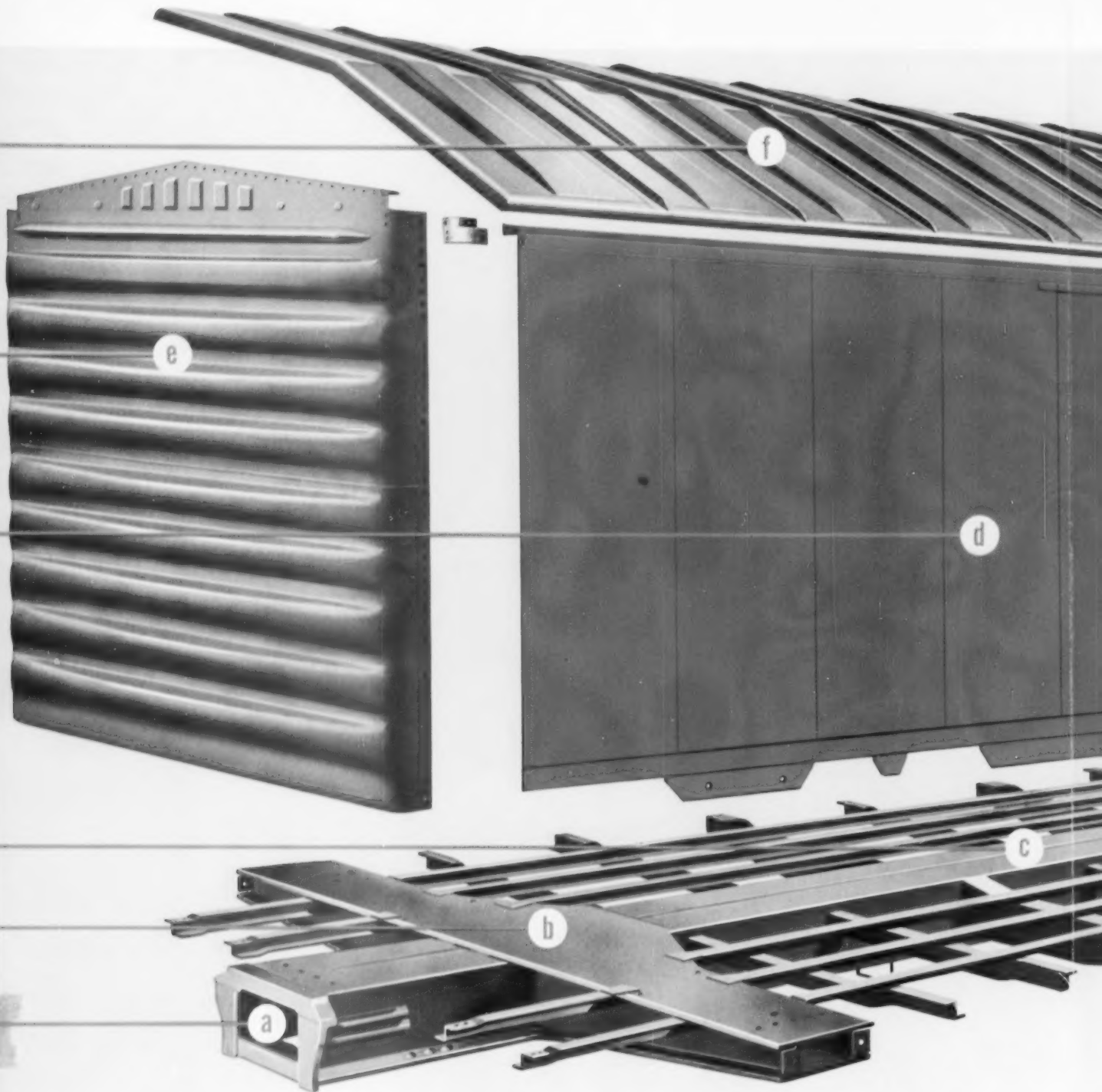
Multi-phase Production

Modern production methods contribute greatly to PS-1 durability and economy. PS-1s pass from position to position under a multi-phase production system. At each station specialists, highly trained in the functions of that position contribute to the building of each car.

Sales and Service

Sales and Service Engineers travel thousands of miles each year to examine PS-1 Box Cars actually in service. Inspections are made under widely varying climatic conditions. Field survey reports are ultimately translated into PS-1 improvements through the coordinated efforts of R&D, Engineering and Production.



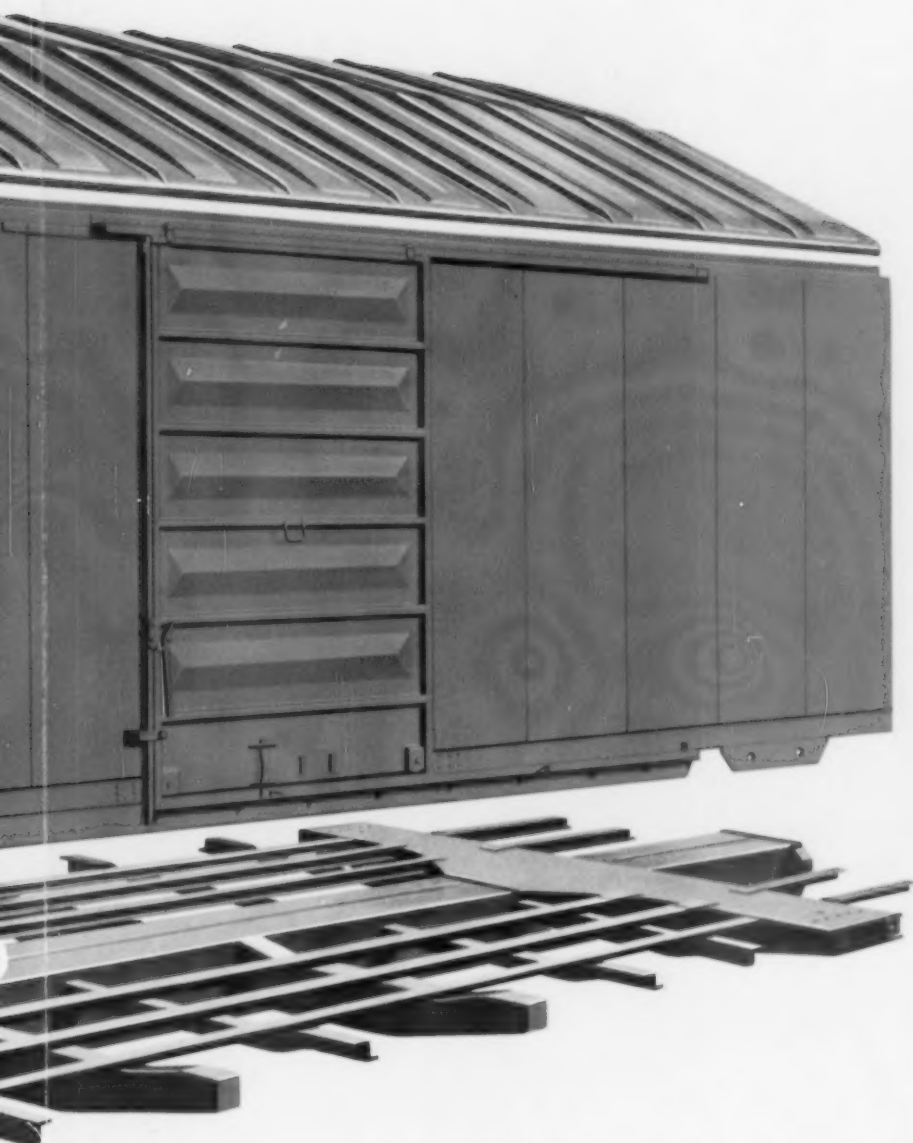


BOX CAR

The PS-1 Box Car is the product of America's railroads. The PS-1 combines many outstanding features to make a box car that will serve efficiently and economically under the diverse operating conditions encountered on all miles of track of The Great American Railway System.

The components of the PS-1 are engineered with economy and service in mind. Neither heavy weights nor light weights, PS-1s meet all strength requirements by design, not merely by costly bulk. Components implement each other to withstand hard service through teamwork. PS-1s are built by advanced production line techniques, including costly jigs, fixtures and dies, impossible for limited production cars. The methods used result in important economies as well as greater over-all structural strength.

Pullman-Standard confidence in PS-1 design, durability and in-service performance has been verified by acceptance. Over 64,000 PS-1s have been put to work by 63 railroads.



a **THE PS-1 WELDED DRAFT SILL** arrangement has strength and durability proved over twenty years of service. Of built-up and arc welded design, this important component has passed many impact tests and the demands of hard in-service usage. Striker, draft lugs and center filler are all of welded construction, and are precision positioned by costly jigs. Considered standard by many railroads, the PS-1 Welded Draft Sill arrangement provides rigid construction with savings in weight and costs.

b **THE PS-1 BOLSTER CENTER FILLER** is stronger than ever, due to the advanced fabrication processes and new design. Improved welding techniques, developed by Pullman-Standard, and important structural changes now provide better stress-flow, as has been confirmed by Pullman-Standard's Research and Development dynamic testing methods. As in other PS-1 Box Car components, precision jigs and fixtures give fabrication accuracy, and contribute to overall quality and performance.

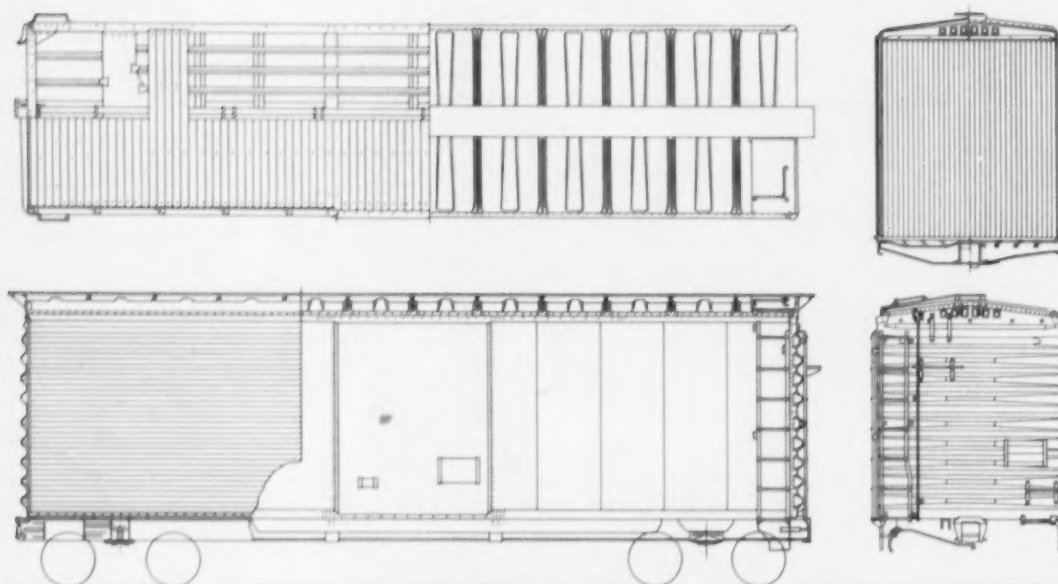
c **THE PS-1 UNDERFRAME** incorporates many important refinements which offset the costly and damaging effects of increasing in-service speeds, shock and impact. As an illustration, the present PS-1 Box Car Underframe includes heavy-duty floor construction which provides an additional cross tie and two additional stringers. PS-1 Underframes are made with precision through use of special jigs and fixtures. Service records prove the superiority of their design and construction.

f **PS-1 ROOFS** have never failed because of inadequate strength. Riveted units built up of roof sheets and carlines, PS-1 Roofs are riveted to car sides and ends. Upward-extending carlines are hairpin-shaped steel sections which form a water-shedding cap. Roof sheets are corrosion resistant copper-bearing galvanized steel. Added roof strength is gained by use of service-tested, die-pressed corrugations of flared design. PS-1 Roofs are engineered against weather, drumming and buckling even under severest conditions of impact, vibration and rack.

e **THE PS-1 END** is designed for maximum strength through contour corrugations. Made in two die-formed parts, automatically arc welded together, the PS-1 End uses 3/16-inch steel sheets for the top half, 5/16-inch for the bottom. The end is riveted to stringers and center sill. The end sill, integrated as part of the end, eliminates a vulnerable-to-corrosion point. Unique embossing at the top of the end adds to strength and to leak-proof roof fit. Inside, each PS-1 End is provided with 7 horizontal wood furrings secured by 1/4-inch stud bolts welded into place. End lining is attached to furring, and is additionally retained by a pressed Z-bar extending entirely across the car end. PS-1 End design allows use of more simplified self-clearing corner post construction.

d **PS-1 SIDES** are engineered to be especially rigid, uniform, and durable. Fabricated of sheets automatically welded together and to Z-bar side posts, PS-1 Sides lead in pound-for-pound toughness. Side sheets are outside side sill and side plate, and are automatically welded to both. Sides are riveted to door posts, and, in car assembly, the complete side is riveted to the ends. Side sill reinforcement is of pressed steel continuously arc welded to the side sill so that the two members act as one.

Flexible Versatility Provides a PS-1 Box Car for Every Need



GENERAL DIMENSIONS

	PS-1 STANDARDIZED BOX CAR		PS-1 STANDARDIZED—INSULATED BOX CAR	
Capacity	50 TON	50 TON	50 TON	50 TON
Length Inside	40'-6"	50'-6"	40'-1"	50'-1"
Length over Strikers	41'-10"	51'-10"	41'-10"	51'-10"
Length between Trucks	30'-10"	40'-10"	30'-10"	40'-10"
Width Inside	9'-2"	9'-2"	9'-2"	9'-2"
Height Inside	10'-5½"	10'-5½"	9'-6½"	9'-6½"
Height—Rail to Floor	3'-8¾"	3'-8¾"	4'-1¼"	4'-1¼"
Side Door Opening—Width	6'-7"—8'-9'	6'-7"-8'-9'-15'	7'-7"	
Insulation			3"-4" insulation at roof, ends, sides, doors and floor.	

Specifications subject to change without notice

SPECIALTIES FOR PS-1 BOX CARS

In addition to being available with varying door widths and insulation, the PS-1 Standardized Box Car can be purchased with the following specialties:

- P-S Lading Strap Anchors
- P-S Compartmentizers
- P-S Cushion Underframe
- P-S Floor Protection Plates
- Other Lading Protection Devices
- Nailable Steel Flooring
- Roller Bearings
- Other items as specified

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

PULLMAN - STANDARD

CAR MANUFACTURING COMPANY

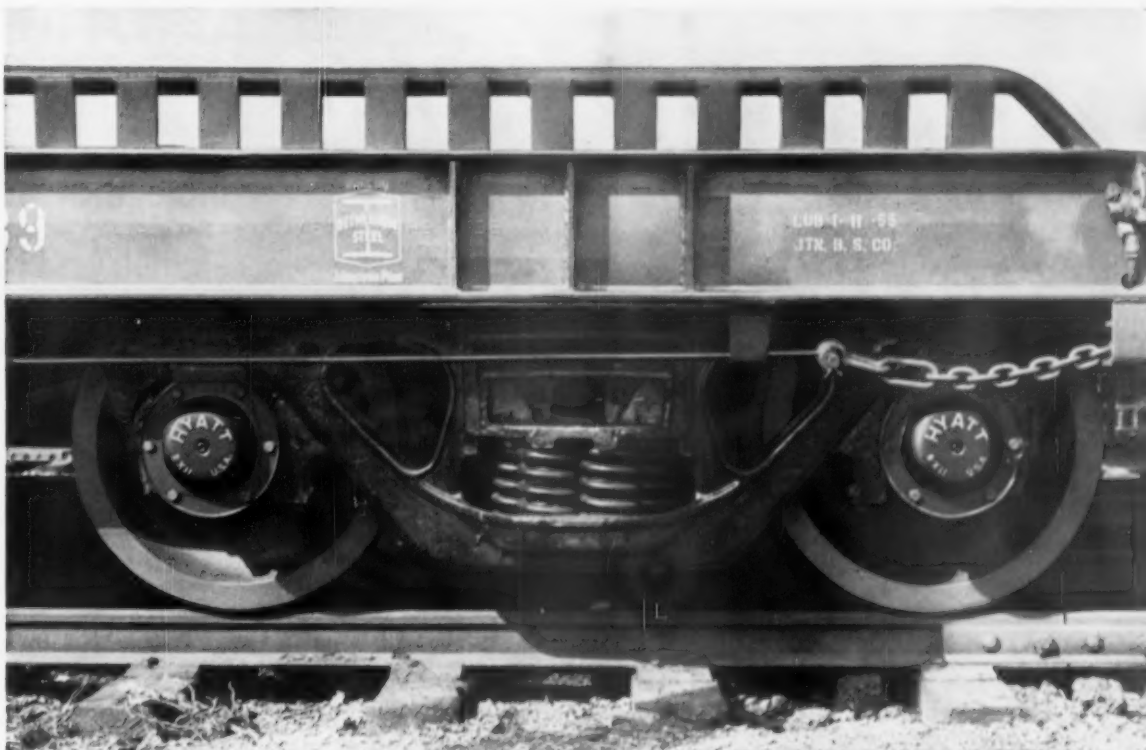
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100 PENNSY **"TRUC TRAIN"** CARS EQUIPPED WITH HYATT JOURNAL BOXES

**FREE LATERAL Roller Bearings Permit Dependable
29-Hour Schedule Between New York and Chicago**

"Piggyback" freight, which promises substantial savings to motor common carriers and a vital new source of revenue to railroads, gathered more momentum with the recent inauguration of the Pennsylvania Railroad's "TrucTrain" service between America's two largest cities.



Flatcars are equipped with high-speed trucks and HYATT Roller Bearing Journal Boxes.



Each specially equipped 75-foot flatcar accommodates two loaded highway trailers.

100 of the specially designed 75-foot flatcars, equipped with free lateral HYATT Roller Bearing Journal Boxes, make the 903-mile run at speeds up to 60 mph. The Pennsy picked roller bearings to prevent hot-box delays, reduce motive power, lubrication and inspection costs. They picked HYATTS to secure the *added benefits* of free lateral—better tracking characteristics, less wear and tear on wheels, trucks and cars.

The more roller bearing experience the railroads gain, the more preference is being earned by HYATTS. When you compare *all* the factors involved, you'll know why! Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

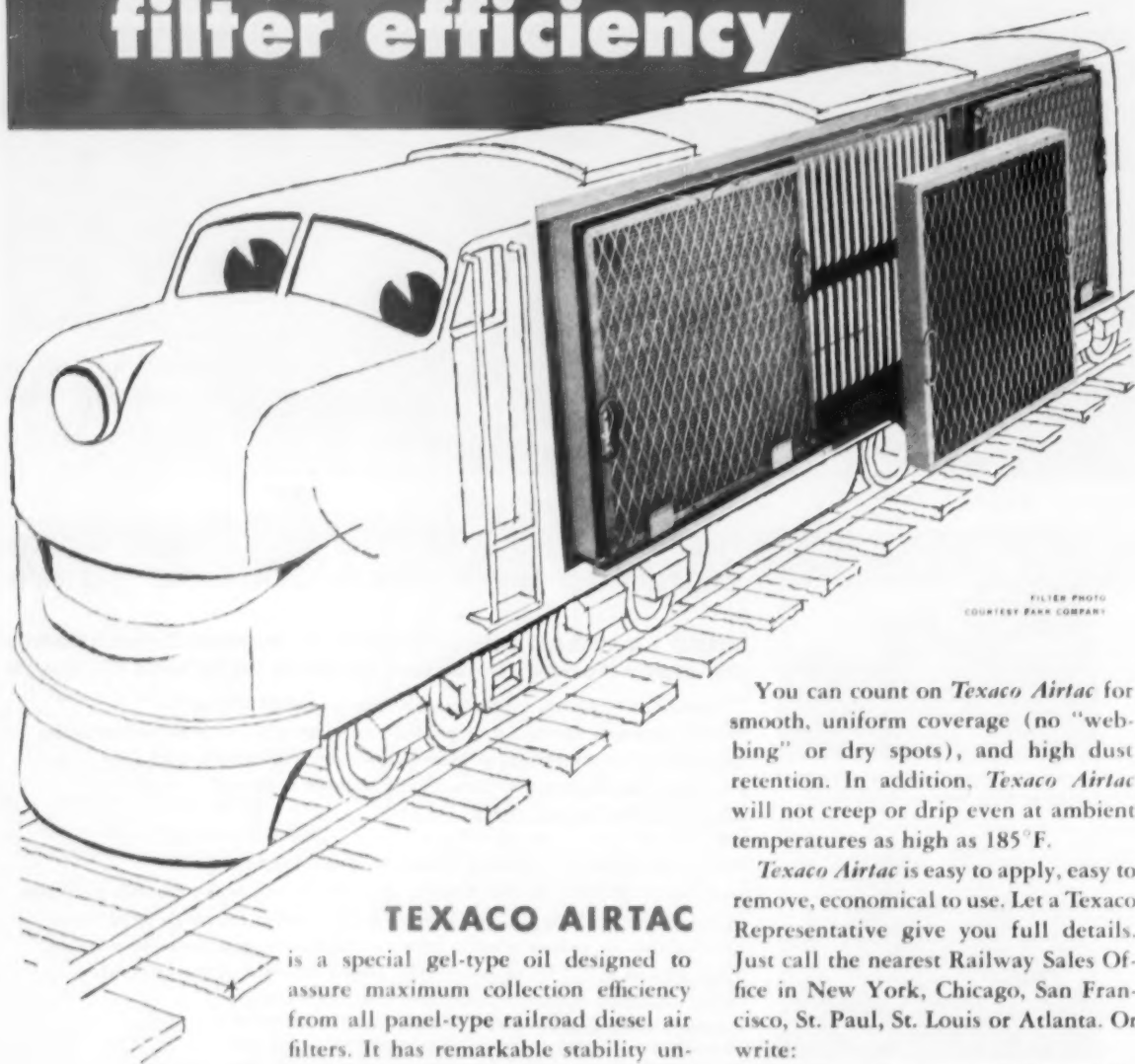
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**ROLLER BEARING
JOURNAL BOXES**

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for maximum filter efficiency



FILTER PHOTO
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is a special gel-type oil designed to assure maximum collection efficiency from all panel-type railroad diesel air filters. It has remarkable stability under application temperatures, excellent water separation characteristics, and is non-foaming.

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IN ALL
48 STATES

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Public Opinion Can Be Important

Riding on trains one will see from time to time a group of passenger cars marked "Condemned." Sometimes these cars remain in view of the railroad passengers for a few days. Sometimes this stretches into weeks.

At first thought it might seem a rather trivial matter as to where a railroad keeps cars that it is about to scrap. But a little more reflection on the subject may show that it is not completely lacking in importance.

The effect on public opinion is bound to be unfavorable. Of those who see it, there will be some at least who will think that the disposition was something forced upon the railroad. The term itself could easily convey this impression. There will also be some who will find no difference between the cars to be scrapped and those in which they are riding.

To the railroad mechanical man, such a conclusion may seem rather ridiculous. To his *trained* eye the difference between series of cars may be obvious a block away. But to the *untrained* eye of the traveler, there is no discernible difference. He therefore reaches the conclusion you would expect, and it does not enhance his opinion of how up-to-date the equipment on the railroad is.

If it is impractical to keep such cars hidden from general view, perhaps a different term or method of marking could be used.

More important than the case itself is the example that the railroad mechanical man is frequently completely oblivious the effect some of his actions have on public opinion. This is important for any industry. It is particularly important for the railroads because of the multitude of regulations which they must live with, and which are determined in the long run by the general public. The elected representative of the public, and the regulatory commissions responsible to this same public, will treat the railroads in some proportion to the interest and sympathy shown to their problems by the people generally. Is not their interest and opinion therefore worth cultivating at every opportunity?

Are We Kidding Ourselves?

Records of steam locomotive maintenance costs accumulated over a period of many years showed that they increased from year to year at about a uniform rate. Diesel locomotives are still so new that the maintenance cost figures are a little confusing, but it is becoming increasingly evident that as compared with first costs they are subject to the same basic law. They rise at about a uniform, but at a considerably higher rate than those for steam locomotives. This is no reflection on diesel

locomotives, since they have been a boon to the railroads and have helped them over trying times.

It is possible, at a price, to maintain any locomotive—steam, diesel or electric—at almost any percentage of its original condition that a user may wish. But eventually, maintenance costs rise to a point at which it is no longer practicable to maintain the old unit. Obsolescence—the introduction of new and better units of course add to the desirability of replacement.

It is the practice on most roads to record cumulative maintenance costs. These average in the costs in early years of locomotive life with current costs, and they actually show only 50 per cent of the real rise above the figure for the first year. If an economic life for a diesel locomotive is established, it would appear that it should be based on current, and not cumulative, costs. The latter look nice on paper, but it would appear that we are kidding ourselves if we use them for establishing locomotive life.

NEW BOOKS

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING—1954. This volume, containing the proceedings of the Plant Maintenance and Engineering Conference which are regarded in engineering circles as the most important statement of current factory maintenance problems, is the most extensive ever published in the series. It contains texts of papers read by 24 authors, and direct answers to more than 1,300 questions. An outstanding feature this year is the summary of 20 roundtable discussions. Separate roundtables were devoted to maintenance problems in many industries. The conference last January was attended by 2,400 engineers from many foreign countries. The two principal sessions this year were devoted to "Planning and Scheduling Maintenance Work" and "Maintenance Cost Control and Budgeting." Other sessions covered preventive maintenance; training people for maintenance work; organization, policies and procedures for effective maintenance; sanitation; work measurement, standard and incentives; getting management approval for maintenance programs; handling maintenance labor; corrosion; hospitals, medical department and first aid rooms, and waste disposal. Roundtables, other than those devoted to specific industries, covered maintenance of plant buildings; electrical distribution systems; electronic controls; use of handling equipment in maintenance work; maintenance of materials handling equipment; lighting equipment; lubrication; plants having less than 25 maintenance employees; maintenance storekeeping; mechanical service equipment; power plants, and janitor work.

Clapp & Poliak, Inc., 341 Madison Avenue, New York 17.

Solid bearing cars earn equivalent of \$250,000 EXTRA REVENUE PER YEAR on each 1000 car investment

You get more cars for your money when they're solid-bearing-equipped — and a bigger return per dollar of car investment regardless of traffic conditions.

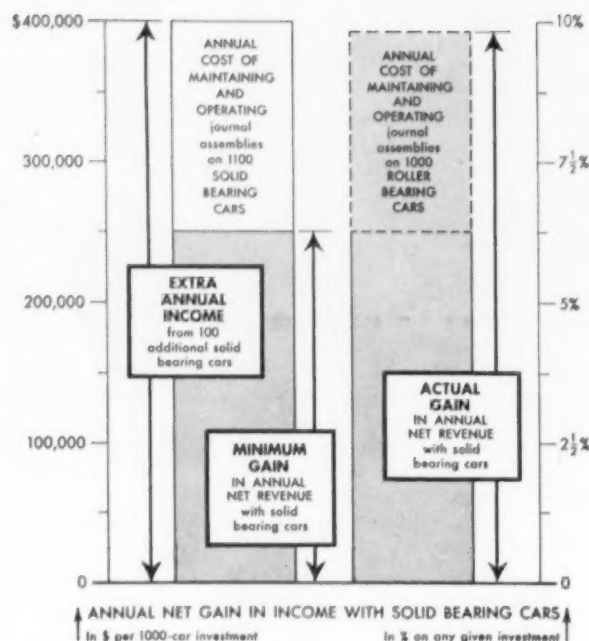
For the same amount of money needed to buy 1000 average roller bearing freight cars, you can buy 1100 or more solid bearing freight cars. And if you want to know what the loss on the roller bearing investment would be, here's a rule-of-thumb to figure it.

First, assuming the extra cars are needed, you estimate their average earnings. Then, from this sum, about \$400,000.00, you subtract the difference, if any, in maintaining and operating journal bearing assemblies on 1100 solid bearing cars as opposed to 1000 roller bearing cars.

Conservatively, you'll find your minimum annual gain with solid bearings to be about \$250,000.00, and it may be as much as \$400,000.00.

By the same token, suppose you only need 1000 cars to meet your traffic requirements. With solid bearings, you reduce your initial costs by at least \$600,000.00 and you get the same proportionate increase in return per dollar of car investment represented by the \$250,000.00 to \$400,000.00 above. And since both freight revenues and bearing operating costs are proportionate to car use, this comparative increase in return with solid bearings holds true regardless of traffic conditions.

Write us for a detailed analysis of the economic advantages of solid-type bearings for



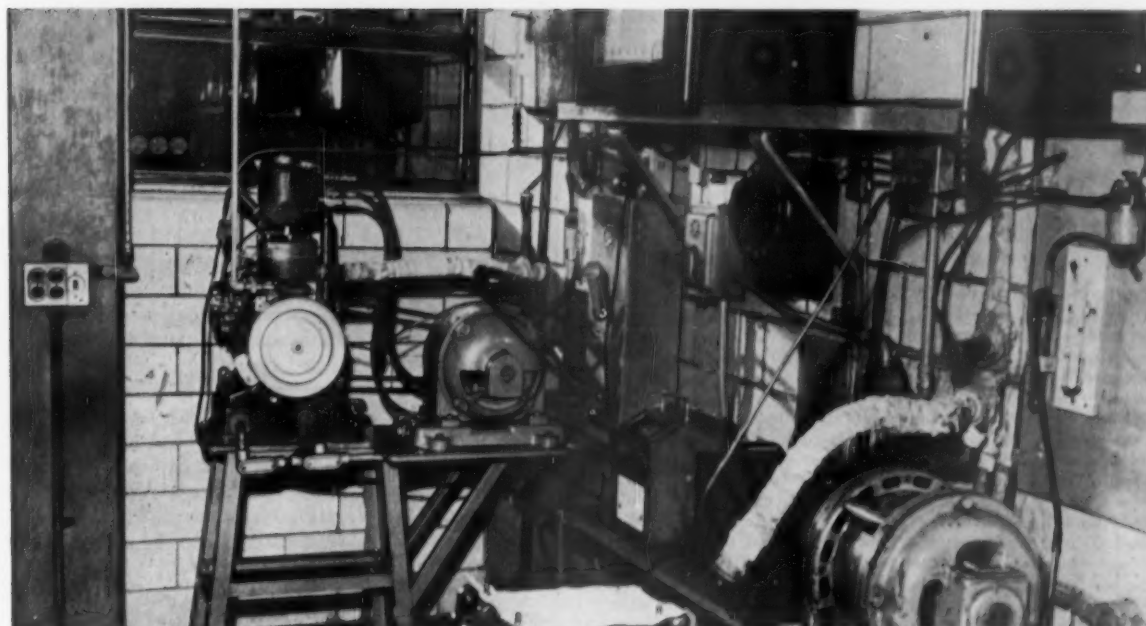
The left hand column indicates the average extra annual revenue that can be earned by buying 1100 solid bearing cars instead of 1000 roller bearing cars, and the center box indicates the minimum revenue gain that would result if the roller bearings could eliminate all maintenance and operating expense. The actual annual net gain, of course, would be this minimum gain plus roller bearing maintenance and operating costs as indicated in the right hand column.

freight cars. We will also be glad to give you information about ways to improve journal bearing performance. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

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MAGNUS METAL CORPORATION Subsidiary of **NATIONAL LEAD COMPANY**



Single-cylinder engines and controls which tell how a given lube oil will affect pistons and rings.

How Rock Island Test Lab Helps Get The Most Out of Diesels

It aids shop forces in many ways from devising a safe way to mix lube oils to establishing standards

The role of a test department in diesel operation and maintenance has come a long way from the early days of the diesel when the principal function was little more than finding out if the lube oil was too thick or too thin. On the Rock Island this progress has taken the form of contributing to better diesel operation at lower cost by making it a simple matter to:

- 1—Pick out from a group of engines coming due for scheduled repairs the ones that, even though they may have lesser mileages, should be shopped first.
- 2—Similarly, to keep in service beyond the scheduled mileage for repairs those engines that are in good shape.
- 3—To establish lube oil standards to assure adequate lubrication and cooling of the engine yet have the oil "weaker" than the engine so that defects will show up and be detectable in the oil before serious damage to the engine occurs.

- 4—To determine by accelerated test and with no damage to the diesel engine parts the effect that any oil will have on bearings, pistons, liners, etc.
- 5—To correlate with practical experience some of the highly technical lab tests to make the results meaningful in terms of what the shop must do and when.

Just how much the Rock Island test department contributes toward stretching mileage between repairs on diesels in spite of heavy loading can be seen by examining the operating practices and general maintenance philosophy of the line and how both compare with other railroads.

There are two schools of thought on the relationship of maintenance requirements to load conditions and how this relationship affects overall diesel operating cost. One school sets the controls to reduce the horsepower output of the engine about 10 per cent on the theory that the maintenance savings will offset any additional operating



THE ROCK ISLAND'S NEW \$25,000 SPECTROGRAPH has speeded up lube oil testing to where a complete analysis of 10 elements in the oil can be met in less than in half a man-hour. This relatively fast handling makes it feasible to check road units weekly and switchers monthly whereas prior to the installation of the new machine oil tests could be made on only a few engines suspected of being in distress—an unsatisfactory procedure for controlling maintenance because of number of examinations even on an engine tested was often insufficient to diagnose its true condition.

Generally speaking, there are two basic types of spectrographs being installed by railroads today. One is designed solely and specifically for lube oil testing. The second type handles a wider variety of work. It is this second general type that the Rock Island bought. While this type may not handle lube oil testing quite as fast as the first category, the Rock Island feels that the slight additional time required is more than compensated for by the added versatility of the instrument, which in addition to its main job of keeping tab on diesel engine condition can also be used for such other lab work as checking the composition of such diverse materials as cement, ballast, steels (especially expensive alloy steels) brass, paint pigments and finding foreign materials in a car of cement.

costs from having to run more units on some trains to get the required horsepower. The other school believes that it is cheaper in the long run to load diesels to capacity, especially during business peaks when two units may be loaded to the extent that three ordinarily might be.

The Rock Island follows the second practice, believing that (1) the use of detergent oils permits diesel engines to be operated at heavy load factor without increasing repair costs to the point where such increase would cancel out the operating savings; and (2) better use can be made of available capital if only the minimum number of units required to handle the tonnage were purchased.

The operating result of this policy is that the Rock Island's average trailing tons per unit is about 25 per cent above the national average and about a third greater than some neighboring roads that reduce horsepower and use straight mineral oil. Despite the heavy loading, there are engines in freight service that have gone over a million miles without removal from the locomotive, and a number with from 600,000 to 800,000 miles. On all these units, piece meal repairs only have been made to the engines and main generators.

Where engines on the Rock Island were formerly removed and given a general overhaul at 550,000-600,000 miles, they are now usually removed only for low oil pressure. If both the engine and the bearings have high mileage, the first thing done is to renew the bearings. If

the engine still shows low lube oil pressure, it is removed. A high-mileage engine is also normally removed for low oil pressure if the bearings have been recently renewed.

The Rock Island feels that two practices permit the extended mileage between repairs despite the heavy load under which the engines operate—the use of detergent oils and an extensive policy of checking its lube oil with emphasis on the interpretation of the results, by means of which any difficulty arising in any part of the engine can invariably be detected at an early stage before it causes serious damage.

Where The Program Begins—And Why

The lubrication program starts with tests on new oils themselves. After checking physical and chemical characteristics known to be essential for a crankcase oil by conventional laboratory methods, other characteristics found to be needed from operating experience are checked by accelerated tests assimilating service conditions.

The test under simulated operating conditions reveals directly the practical results that can be expected with an oil in the form of dirt accumulated, deposits on the different engine parts and the wear. The test is made on a one-cylinder gasoline engine that is operated under closely controlled conditions such as horsepower developed, rpm, air-fuel ratio, quantity of fuel used per minute, temperature of crankcase oil and coolant, and air pressure in the crankcase.

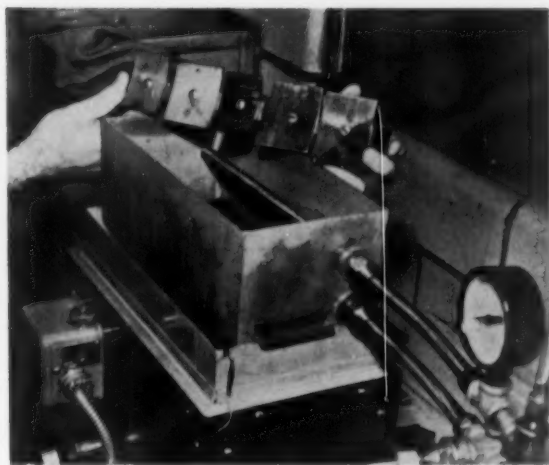
The parts are accurately measured and weighed before and after each test. The quantity of lube oil used and the analysis of the oil before and after the test is recorded. The dirt accumulated on the engine parts is weighed. Appearance of the piston skirt as to discoloration and gum and lacquer formation is made and evaluated. The condition of the rings, ring grooves, ring lands, and fit of rings in the grooves, whether free or sluggish is noted.

In order to make this a quick accelerated test that can be used not only for approval of new oils and additives but also for checking individual shipments of approved oils, the temperature of the coolant is raised to 375 deg. and that of the crankcase oil to 300 deg., or approximately 126 deg. higher than in an average normal operating railroad diesel engine. As every 18-deg. rise in temperature doubles the oxidation rate, a 30-hour run in the test engine is equivalent in oxidation to 3,840 hours in a locomotive diesel.

In granting approval to a new oil, two 30-hour tests are run with the engine torn down and examined in between. For routine checking of individual shipments of an already approved type of oil, one 30-hour period is considered sufficient (the 3,840 hours would be equivalent to about 200,000 miles on a passenger engine).

The reasoning behind the 30-hour accelerated test is as follows: It is assumed that an "oil change" due to consumption takes place every 20,000 miles of operation. Therefore, when an oil stands 30 hours in the test engine, the 200,000 miles of service that the 30-hour test is equivalent to is ten times as long as the oil would ordinarily have to stand up in the engine without extensive or harmful lacquering of parts or sticking of rings.

Future reference to any particular test is easy. The piston used is marked with the number of the test and stored in a metal cabinet with the paper records of the



Hot oil spray gives the effect either of a new oil on approved bearings or approved oil on new bearing materials

test (e.g. time, water and oil temperature graphs, etc.) are stored below. Thus, to see what the oil in test No. 483 did to the piston, it is only necessary to find the piston numbered 483. This will show how much gum, lacquer and other deposits formed on the piston, whether the rings were stuck or free, condition of the lands, etc. At the same time the paper records in the lower part of the cabinet will give remaining pertinent data desired.

Oxidation and stability of the oil, and its effect on bearings, is tested by spraying hot oil at 300 deg. F. on pieces of bearing metal and on pieces of pure lead and copper. In this test a pump takes heated oil from a tank and forces it through nozzles on to the bearings in an enclosed space. The test pieces are cleaned and weighed before the start of the test, and weighed again after each of three 5-hour periods. The oil is analyzed before the test and after each 5-hour period. This test serves as a good comparative evaluation of oils for approval and as a means of checking shipments of oil for quality control. This test can also be used to test new bearing materials by spraying them with an approved oil.

The Rock Island feels that resistance to oxidation when heated is a desirable quality in a crankcase lubricant because 85% of the function of the oil is to cool the engine, and only 15% is for actual lubrication of friction surfaces. Also severe local heating requires that the oil must be able to stand extremely high temperatures of short duration.

Why Oil Should Not Be Too Stable

Resistance to oxidation might at first seem to be a case of the more the better. Actually, the resistance can be carried too far. If oil were to be made absolutely stable to temperature, an abnormal operating engine could not be detected by testing the oil. Making the oil tougher than the engine would remove the best present means of finding heat distress from clogged and inoperative oil coolers and radiators, shutters, clogged oil lines, or many other things that would lead to an overheated engine with resultant destruction of parts. Actually there is no oil available that is this stable to temperature, but if it were possible to make such an oil the engine might



Numbered pistons serve as own record of deposits, stuck rings, etc. from a test oil. Bottom shelves contain paper data

become badly damaged with no warning showing up in the oil because it would still be in good condition after the engine became inoperative.

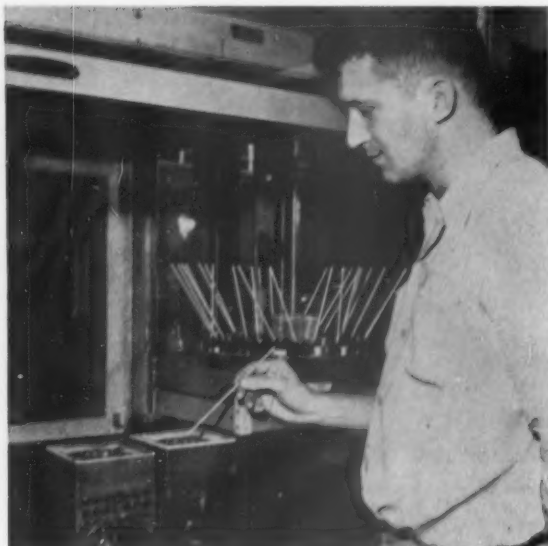
When diesels were first put into operation, the gumming and lacquering of pistons caused the Rock Island to feel that straight mineral oils were not satisfactory. The road still follows a policy of using heavy duty or detergent oil, and two years ago added a unique feature to the program.

In October 1952 the Rock Island began buying a number of different base stocks to a specification and mixing these with one additive at a definite percentage. The work is done at Silvis, mixing the additive with a tank car lot at a time of the specification oil from one of the supplying oil companies. This oil can then be used in any engine on the road as all oils, regardless of the supplier, have the same additive. Except for mixing only one base stock at a time with the universal additive, no attempt is made the keep different brands separated or distinguished either in storage or in an engine.

Drainage from all engines using the same SAE grade is reclaimed by heating and steam stripping off the volatile contaminants, then removing the remaining contaminants by clay contact and filtering. At first this oil was used only in switchers without re-fortification with additives. The next step was to re-fortify but still restrict its use to switch engines. Today by pre-treating with acid in addition to the regular process, the drainage is brought to the same specification as new base oil. It meets the same tests and requirements, and is universally used in all types of power, the same as new oil.

Oil Tests Control Maintenance

Two general types of tests are made on lube oil to determine the need for many types of repairs. The first type comprises the typical checks of physical characteristics (flash, viscosity, water, etc.) made by most roads, plus blotter spot tests. Oil samples for these tests are taken weekly on switchers and sent to the laboratory of the terminal for the area where the switcher operates. Samples on road units are taken each time a unit arrives at one of the four terminals on the system. If the unit



Oil for spectro analysis is sent in disposable plastic vials and the sample removed by a soda straw

is to spend over an hour in the terminal, the tests are completed, and the results are used for recommending any work needed, such as oil or filter change.

While the spot tests are used primarily to indicate when to change lube oil filters, careful observation and interpretation of a series of spot tests under ultra-violet light has been found to tell a great deal about the condition of the lube oil as to oxidation, detergency, presence of fuel dilution and water.

A daily report of results is submitted to the Chicago Laboratory from each of the control laboratories, and these results are recorded on a card which is kept for each engine, and from which card a tabulation is made at the end of each month of the number of tests made, number of engines, per cent showing light, medium or heavy dilution, water present, drainages recommended due to oil conditions, etc. These tabulations are compared with the previous month, and with the same month of the previous year.

The spectrographic analysis is the most meaningful of the tests made on the lube oil in terms of what it can tell about the condition of the different engine parts. The procedure for handling the spectro tests is of necessity more comprehensive because the samples must be shipped to the central headquarters and the results analyzed in a short period before any defect brought out by the test has done damage to the engine. The Rock Island procedure for spectro testing and recording is as follows:

The oil samples are taken by the laboratory at whatever one of the four terminals to which the unit is assigned. This is done weekly on a road unit when it goes through its maintenance terminal for inspection, and the sample is subsequently sent into the Chicago Spectrographic laboratory.

A minimum of 50 and an average of 60 samples a day are analyzed and the results recorded. With three men (24 man-hours) this averages 0.4 man-hours per sample, which is expected to be reduced as experience is gained in the technique and operation of new spectrograph equipment. This 0.4 man-hour spent making the

spectrograph analysis pinpoints the repair needs of the locomotive as to bearings, rings, pistons and liners, water leaks, oil filter changes, air filter maintenance and lube oil quality.

Experience and judgment play important roles in interpreting the results of the spectrograph tests as to trends. For example, a high silicon can indicate road dirt and would be expected to lead to a high wear rate and consequently a rise in bearing metals (lead, copper, silver) and in iron from the rings and cylinder walls. In most instances these concentrations would be reduced by changing oil filters. Where this does not reduce the concentration, faulty bearings, rings, liners, or oil coolers would be the next logical possibilities to suspect. Reference to regular lube oil control data, and viscosity, flash and spot tests may also give added clues in tracing down the specific cause of wear. Other examples of what the spectro analysis can show and predict are:

Where water leaks are indicated by the presence of chromium or boron in the oil, high readings of bearing metal would be expected to follow because each slug of water in the oil would cause a thin layer of bearing metal to be wiped as it passed through the bearing.

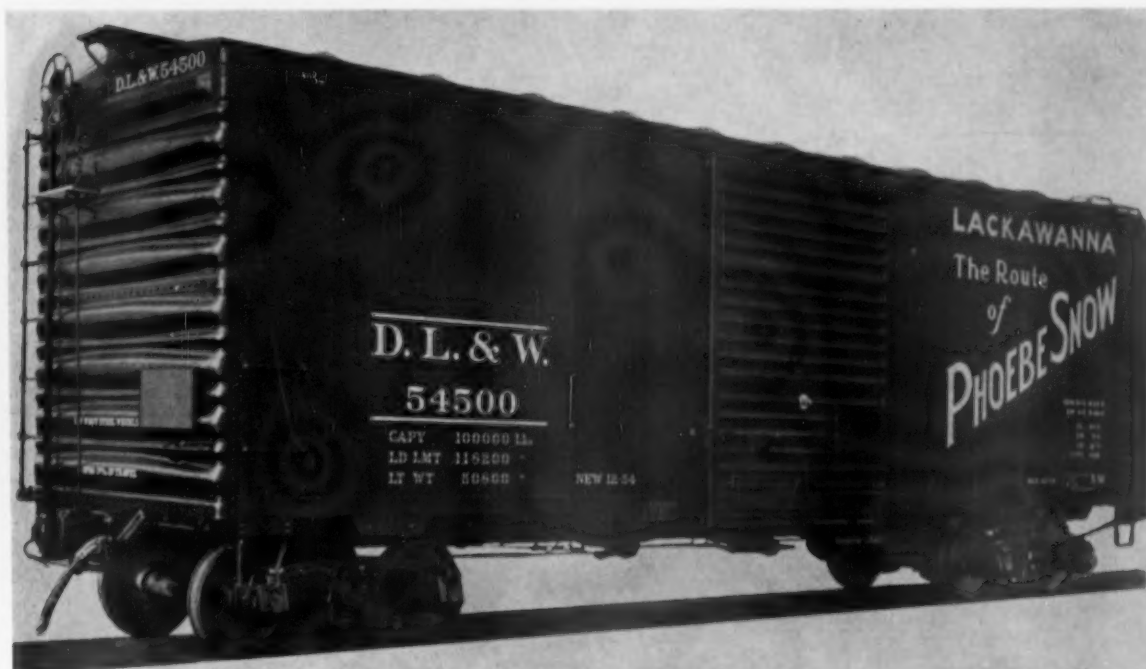
In some engines with aluminum pistons and chrome plated liners, the presence of aluminum along with chrome, even with low silicon, would be strong evidence of piston seizure and would usually be followed by a rise in lead or copper.

Low silicon, with lube oil control tests normal, and a small increase in lead and copper along with a substantial increase in iron, could mean a bearing worn through to the steel back.

Reports of the spectrograph analysis along with what the lab thinks the shop will find are sent to the local foreman in direct charge of the work, to the master mechanic concerned and to the general superintendent of motive power. For future guidance of the lab in improving the accuracy and scope of predictions on what a given reading combination means in terms of engine maintenance requirements, the shop sends the lab a report on what was found when the engine was inspected. This constantly increasing accuracy of interpretation of oil tests in terms of engine work required has been instrumental in extending inspections and overhaul on those engines where the lube oil record indicates low wear and to concentrate on those engines where higher wear is shown by contaminants in the lube oil.

A good example of the way this procedure works is a unit which has accumulated 750,000 miles since overhaul. This unit had been on "watchful waiting" for some time. The engine was not torn down at 550,000-600,000 miles (which was formerly required procedure) because the spectrograph showed it to be in sound operating condition. Instead, it is carefully watched and kept in service until the lube oil analysis showed that overhaul was necessary.

Currently there are five passenger, five freight and eight switching locomotives that are being operated beyond the mileage at which they would have been torn down if rigid mileages were set for overhaul. No definite figures are as yet available on what percentage of units can have repairs postponed, but the number is expected to increase with the continuing improvement in the technique of interpreting the spectrographic analysis and lead to important savings in maintenance costs.



The first Magor-built car. Placard boards on doors and ends can be reached from ground level.

Lackawanna Box Cars Fitted for Modern Service

Sturdy construction aims at low maintenance costs and long life for 1,000 new cars

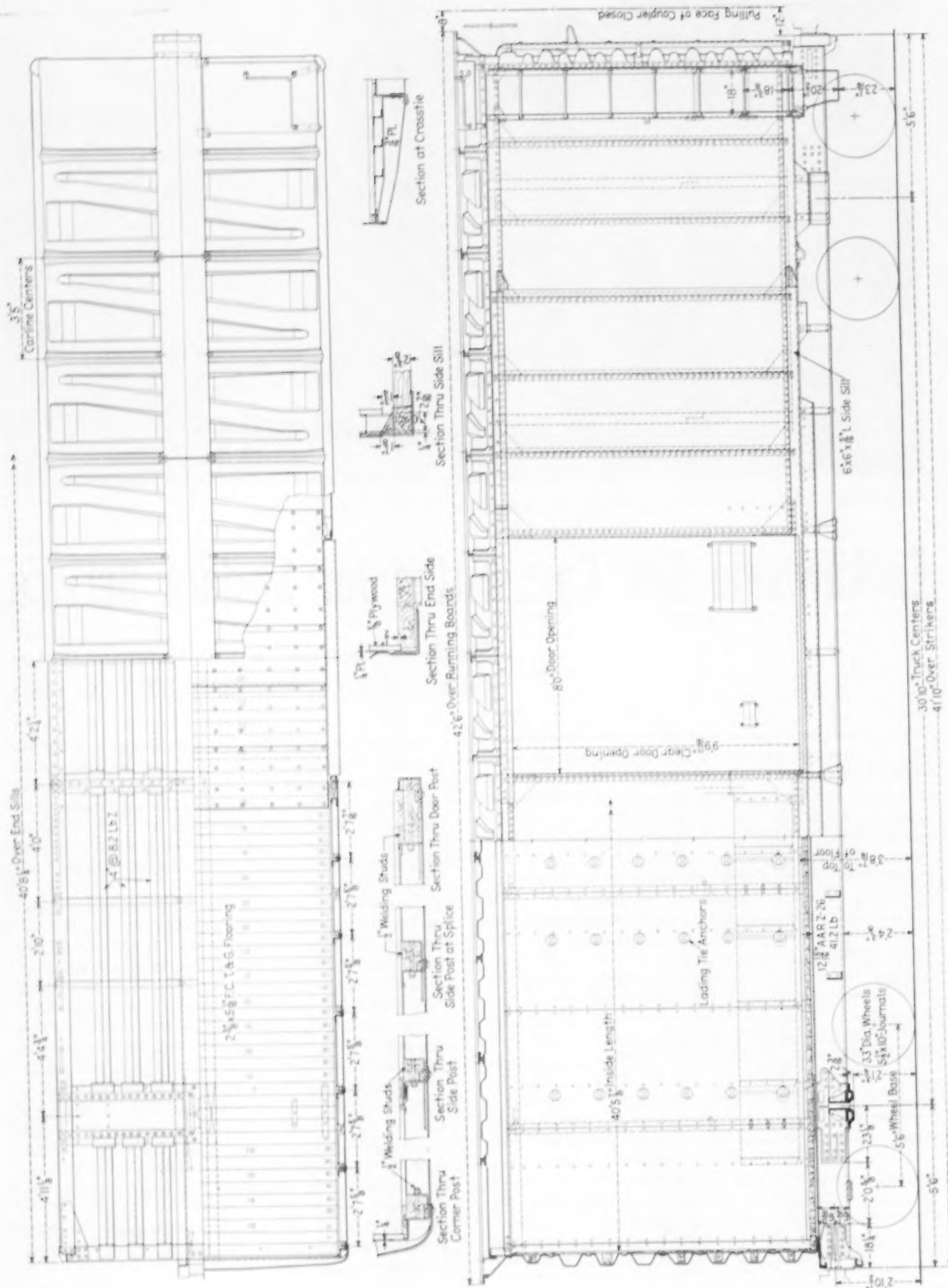
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Yokes.....	Symington-Gould Corp., New York.
Draft gear.....	Seulin Steel Co., St. Louis.
Centering devices.....	Symington-Gould Corp., New York.
Bolster center filler; striker.....	Cardwell Westinghouse Co., Chicago.
Ends, roofs, floor plates.....	W. H. Miner, Inc., Chicago.
Doors and fixtures.....	Waugh Equipment Co., New York.
Running boards and brake steps.....	Standard Railway Equipment Mfg. Co., Chicago.
Floor clips.....	Symington-Gould Corp., New York.
Primer and paint.....	Standard Railway Equipment Mfg. Co., Chicago.
Truck bolsters.....	Superior Car Door Co., Chicago.
Side bearings.....	Youngstown Steel Door Co., Cleveland.
Side frames.....	Morton Mfg. Co., Chicago.
Springs.....	United States Gypsum Co., Chicago.
Ride Control.....	MacLean Fogg Lock Nut Co., Chicago.
Journal bearings.....	Pittsburgh Plate Glass Co., Pittsburgh.
Journal-box lids.....	Sherwin-Williams Co., Cleveland.
Wheels.....	Symington-Gould Corp., New York.
Brake beams.....	A. Stucki Co., Pittsburgh.
Air brakes.....	Symington-Gould Corp., New York.
Hand brakes.....	American Steel Foundries, Chicago.
Brake regulators.....	National Malleable & Steel Castings Co., Cleveland.
	Symington-Gould Corp., New York.
	Crucible Steel Co. of America, New York.
	American Steel Foundries, Chicago.
	Magnus Metal Corp., New York.
	American Locomotive Co., New York.
	(Motor Wheel) T-Z Railway Equipment Co., Chicago.
	Armco Steel Corp., Middletown, Ohio.
	Bethlehem Steel Co., Bethlehem, Pa.
	Edgewater Steel Co., Pittsburgh.
	United States Steel Corp., Pittsburgh.
	Buffalo Brake Beam Co., New York.
	Chicago Railway Equipment Co., Chicago.
	Westinghouse Air Brake Co., Wilmerding, Pa.
	Ajax Consolidated Co., Chicago.
	W. H. Miner, Inc., Chicago.
	National Brake Co., New York.
	Royal Railway Improvements Corp., Wilmington, Del.
	Westinghouse Air Brake Co., Wilmerding, Pa.

Low maintenance costs, high train speeds and the use of modern materials-handling equipment were important factors in determining the design of 1,000 box cars by the Lackawanna. Orders for these 50-ton cars were placed last August with the Berwick, Pa., plant of ACF Industries, Inc., and with the Magor Car Corporation. Deliveries began in January and were completed during March. Each plant built 500 cars.

The cars are built of copper-bearing steel with a structure heavier than normal for 50-ton cars. Two 41.2-lb. Z-sections comprise the center sill. The side sills are 6 x 6 x 5/16-in. angles. The six floor stringers are 4-in., 8.2-lb. Z-sections. They support a 2 3/8-in. wood floor which is reinforced with a 3/16-in. steel protector plate 10-ft wide at the door opening. Each side assembly has two more posts than usual for a car of this type. Gussets are installed at the top and bottom of every post. The sheathing is riveted to the frame. Above the floor level between the side posts and over the ends 1/4-in. backing plates are installed. These plates fill the gaps between the frame members and reinforce the bottom of the lining. The lining is 5/8-in. plywood. Seventy-two lading strap anchors are provided on the side walls. The door openings are 8-ft wide.

All the cars are equipped with high-speed A-3 Ride Control trucks with 5 1/2-in. x 10-in. journals and one-wear (Continued on page 49)





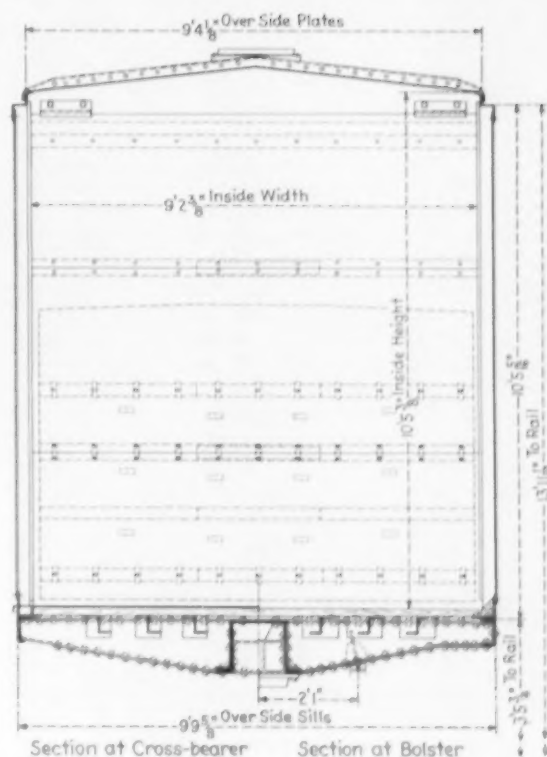
Plywood lining is completed by ACF crew. Already installed are heavy flooring and lading strap anchors



Six floor stringers and backing plates on side and end walls give extra support to floor and lining

wrought-steel wheels. The springs have $3\frac{1}{16}$ -in. travel. Unit type brake beams are used. All the draft gears are of the high capacity rubber type. All the axles and some of the truck and air brake material came from the Lackawanna.

The road numbers of the ACF cars are 54000 to 54499, and the cars delivered by Magor are numbered 54500 to 54999. The light weight of the car is 50,800-lb.





GRAVITY CONVEYOR feeds finished wheels from inspection platform to shipping platform.

Here's the AAR, X-2 Wheel

New 1.5 carbon cast-steel wheel has wear resistance of steel wheels plus resistance to brake shoe heating

As far back as 1941 the American Brake Shoe Company assigned priority to a research project to develop a freight car wheel which would better withstand the heavier loads and more severe braking which were becoming commonplace in modern freight operation. The specific objective of this research program was to perfect a wheel combining the physical advantages of steel with economic advantages of modern casting methods.

With that goal in mind, metallurgists at the Brake Shoe Research Laboratories in Mahwah, New Jersey, began a step by step investigation of freight service requirements as a means of determining what the ultimate essentials of wheel design should be. Then began a patient search for the precise metallurgical analysis which would best satisfy these design prerequisites. Six years of experiment and evaluation in the research foundry resulted at last in the development of a unique 1.5 per cent carbon steel which showed outstanding promise for car wheel application. Physical tests were encouraging.

The new steel had thus far proved successful in the laboratory. But how would it perform under actual operating conditions? To answer this question experimental field testing was instituted on the Bangor and Aroostook in July, 1947. Test wheels were placed under a 50-ton rack car where they proceeded to accumulate 5,000 miles per month under constant load of 10-1/2 tons per wheel—operating over frozen roadbed in the winter

and encountering extremes of temperature found in few other parts of the country. Accelerated testing under these severe conditions provided the basis for further design refinements which, in turn, were tested on the same proving ground.

After two years' successful experience on the Bangor and Aroostook, the scope of field testing was expanded through agreements with individual railroads handling special cars over assigned routes. Further extension of field test came in 1951 when the AAR Committee on Wheels granted permission for placement of 1,000 1.5 per cent carbon cast steel wheels in experimental interchange service, designating this type of wheel the AAR-X2. Later, in 1953, anticipating full-scale production of the X-2 wheel, the Committee increased the authorized total to 100,000.

It was Brake Shoe's policy, in pursuing the proof testing of this new wheel, to place in service only a limited number of the originally authorized 1,000 total so that all wheels in service test could be frequently and carefully observed. In this way performance could be measured throughout the service life of each wheel and compared directly to that of standard wrought steel wheels running in each test car truck on a 50-50 basis. Altogether, 202 of the AAR-X2 wheels, made to a standard analysis and metallurgical structure, have been tested throughout the United States under 49 cars.



1 AFTER HEAT TREATING, wheels emerge from furnace in lots of 12. Next step in process will be hub cooling.

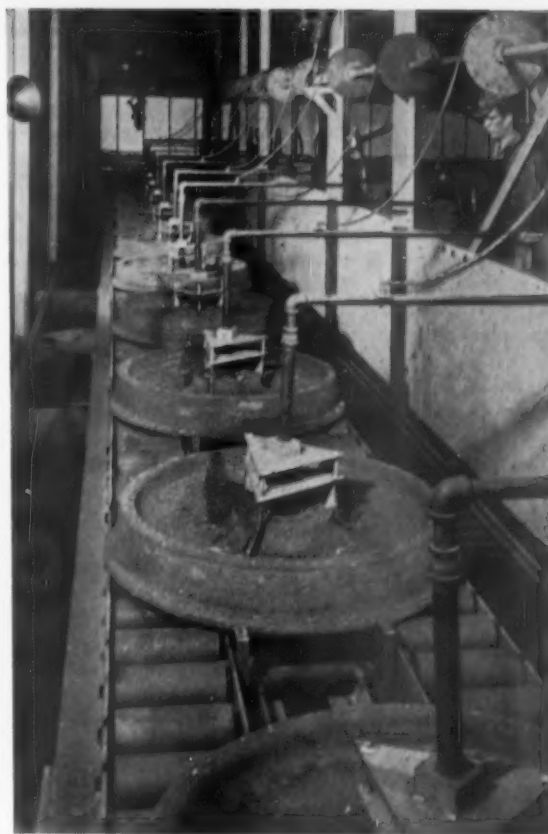
As of April, 1955, after somewhat over $4\frac{1}{2}$ years of actual field testing, all test cars had accumulated a total of 5,200,000 car miles, or an average of 106,000 miles per car. Two test cars have averaged 333,000 miles each on the original AAR-X2 wheels without failure.

The metal for X-2 wheels is melted from cold stock in electric arc melting furnaces. The normal chemical analysis of the metal used in the wheel is:

Total Carbon 1.35 to 1.55%
 Maganese, not less than 0.05%
 Silicon 0.30 to 0.05%
 Phosphorus, not over .07%
 Sulphur, not over .07%

This metal is similar to common die steels which, like railroad wheels, must withstand a combination of heat, abrasion and impact. Its physical properties include tensile strength ranging between 100,000 and 120,000 psi, elongation from 4 to 6% and yield point of 60,000 to 70,000 psi. The metallurgical structure is uniform from flange to hub and the hardness runs in the neighborhood of 245 to 255 Brinell. Advantages of the 1.5 carbon wheel claimed by Southern are:

- Safety, represented by conservative design, inherent strength, and proved record in road test averaging over 100,000 miles per test car.
- A combination of modern foundry techniques and time-tested casting methods which result in lower costs.
- Automatic machining of all wearing surfaces for precise dimensional control, unsurpassed rotundity, and outstanding dynamic balance.
- Exact heat treatment for tough, dense, homogeneous steel from flange to hub, exhibiting uniformly superior wearing qualities. No transition areas.
- Conventional steel wheel shop practice for taping,



2 HUB COOLING station where hubs are water cooled to give favorable stress distribution and provide easier bore machining.



3 SHOT BLAST station. Wheels at right are being fed to shot blast; those at left have been processed



4 BORING mill shown here is used for obtaining other than standard bore when requested by customer

boring and mounting. (Three standard tapes).

- Identifying markings cast in bold letters on back plate where they will not be obscured by grease and dirt.
- Wear resistance equal to or greater than that of any steel wheel, plus excellent resistance to brake shoe heating. No indication of thermal checking or cracking in treads on any service test.

By 1953 company officers, having become thoroughly convinced of the capabilities of the new wheel as demonstrated by six years of test, were ready to approve plans for the erection of production facilities. Plant construction began in June of that year.

Built at a cost of \$3,500,000 in Calera, Alabama, the plant incorporated the most modern foundry techniques while retaining features of long-proven reliability in cast wheel manufacture. It is located on a 45-acre site 35 miles south of the Birmingham steel center.

The plant is constructed primarily of corrugated asbestos cement sheeting applied to a steel frame, with a floor area of roughly 75,000 square feet. A novel arrangement of vertical louvers forming the outside wall around one end of the building permits opening virtually the entire expanse of wall on three sides for unimpeded ventilation. The administrative office, detached from the plant proper, is air conditioned for summer comfort.

Initial plant operation on a trial scale began in February, 1954. With basic production methods having been largely resolved during earlier pilot work in the Mahwah experimental foundry, rapid progress was made in getting Calera production underway. By April 1, 1955, with installation of some additional equipment still scheduled, output reached approximately 700 wheels per week. At full capacity, the plant will be able to produce close to 400 wheels a day.

Molding—Material storage is concentrated at the east

end of the building. Molding and core sands, brought in by rail, are stored in enclosed hopper bins with a present capacity of about 370 tons. At this end of the plant, too, are bins for steel scrap, melting furnace refractories, and various alloy components for the charges.

Near the storage area, resin-bonded hub cores are made in aluminum boxes by means of a bench core blower. They are ready for use after only a few minutes baking in a conveyORIZED, dielectric core oven with capacity of 90 cores per hour. Space and handling are both reduced since there is no need for core storage and consequently no necessity for storage racks.

Two types of sand are used in the wheel molds themselves—facing sand and backing sand. The former is a fine textured new-sand mix which is employed, as the name implies, for the face of the mold next to the pattern. It produces a smooth surface. Backing sand, which comprises the major portion of the mold, is added on top of the facing. Both types, together with their bonding agents, are mixed in an automatic muller which is gravity fed from overhead storage hoppers. An electronic moisture device checks each batch of sand and then adds the proper amount of water. After it is mulled, the sand is dropped into a pressure tank from which it is then blown through a pneumatic pipe system to a storage bin at the molding station. Periodic daily sand tests plus carefully maintained records assure close control of this important production element.

At the molding station an automatic disc-type hydra slinger produces consistently uniform wheel molds at a rate of about 60 an hour. Copes (top halves of molds) and drags (bottom halves) are rammed separately on a rotating turntable beneath the sand-slinger. During this operation, the flask (cope or drag) and pattern rotate while the slinger head travels radially back and



5 MACHINING is done on a bank of Bullard vertical turret lathes with one chucking operation

forth. The momentum of the sand entering the flask at high velocity causes it to become tightly packed around the pattern. Mold hardness, an important variable, can be controlled through an adjustable cam which governs slinger head travel and frequent hardness checks are performed on a routine basis. Approximately 800 lb of sand go into each mold.

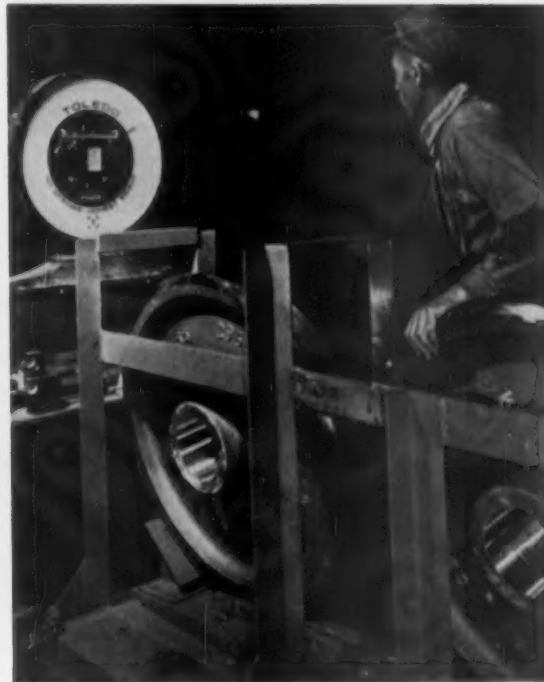
Flasks of conventional type are used together with tread chillers—a metal ring around the periphery of the mold. The latter produces dense tread metal as well as an accurate contour and promotes directional solidification, in turn, induces soundness.

Melting—Electric furnace melting is used to attain precision in metal analysis. Although provision has been made in plant design for the later installation of cupolas—with a view toward duplexing the metal—current practice has thus far proved eminently successful.

Charges for the electric furnaces are made up adjacent to the scrap bin in bottom-drop charging buckets. Selected charges, usually containing a large percentage of broken-up scrap steel wheels, are loaded into the buckets with an electromagnet, and are weighed as loaded.

The complete battery of four 3,500-4,000 kva, 9-foot, top-charging arc melting furnaces have been installed. Three are currently in operation. These have a nominal capacity of from 6 to 7 tons and require approximately 60 minutes to melt down a cold charge. Actual furnace capacity is determined by the thickness of the refractory insulating walls. Each 12-wheel heat is melted under closely controlled basic oxidizing conditions with careful attention given to temperature and analysis. Alloy additions are made at specified intervals during the heat.

Shortly before a heat is tapped, samples are taken from the furnace to the chemical laboratory, which furnishes at least two preliminary carbon determinations



6 WHEEL INSPECTION—after tape size has been stenciled on wheel plate, weight is recorded and wheels moved to shipping platform

for that heat. The laboratory also performs a comprehensive chemical analysis for each heat poured.

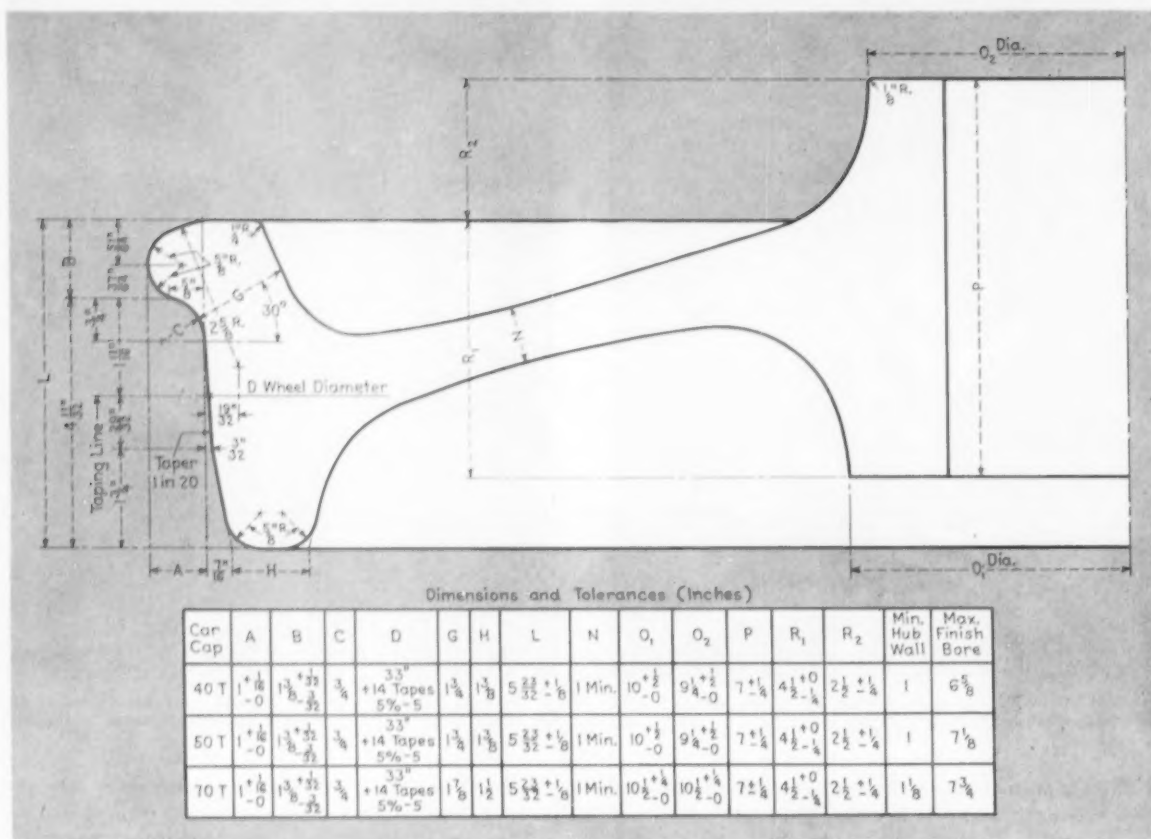
When the steel is ready to be tapped from the furnace (at a temperature of about 3,000 degrees F), it is drained into a teapot-type reservoir ladle. From there it is transferred to bottom-pour ladles, each holding enough metal for three wheels. Then, at a temperature ranging between 2,830 and 2,760 degrees, it enters the mold by gravity through a specially designed feeding head at the center. Approximately 15 seconds are required to fill each mold.

In foundry terminology, a "gate" is an opening through which molten metal enters a mold. "Risers" are reservoirs of hot metal designed to "feed" the casting as it solidifies and thus prevent shrinkage voids. A unique gating arrangement, originating from the center feeding head of the wheel mold, distributes the metal evenly to all parts of the mold cavity thereby producing a uniformly sound casting without the need for auxiliary risers. One important component in this gating system is a strainer core to prevent passage of slag into the mold.

As mentioned earlier, the chiller ring around the outside of the mold causes solidification to occur from the outer regions toward the center. The last part of the wheel to freeze, therefore, is that area directly beneath the feeding head with the consequent result that internal shrinkage is eliminated.

A sample Y-block is also poured from every heat. This block is subsequently used as the basis for physical test specimens and chemical analysis drilling—all for the purpose of arriving at a complete physical and chemical evaluation of the steel poured from that heat.

Shakeout—Following pouring, the molds travel toward the shakeout on a timed conveyor, about 55 minutes being required for complete solidification to take place. After the proper time interval, the large hub riser



(feeding head) is detached from the casting by cracking open the mold. Shortly thereafter the solidified wheel, still red hot, is removed from the mold in an automatic shakeout which is controlled by pushbuttons and photo-electric eyes.

Sand travels by belt conveyor back to storage bins to be reclaimed for further use. Upon emerging from the shakeout cabinet, the wheel is sandblasted, and the pouring gates in the hub bore are removed.

The wheel is now ready for annealing and heat treating. Placed in an insulated, unit-type annealing pit after shakeout, the wheel is permitted to cool slowly to a temperature no greater than 1,000 degrees, a process requiring perhaps 10 hours. Each pit holds twelve wheels.

Following annealing each wheel is subjected to an electronically controlled, two-stage heat treatment. This refines the grain structure and spheroidized the carbides in order to realize the full degree of wear resistance and toughness inherent in the metal. Presently used for this purpose are two car-bottom type furnaces, each with a capacity of 72 wheels in 24 hours. Installation of additional furnaces will be completed in the latter part of June.

Fifteen minutes after wheels are taken from the heat treating furnaces, the hub of each wheel is cooled for five minutes by means of a specially developed water spray device. This operation induces favorable stress distribution as well as providing easy machinability.

As with any heat treated casting, the X-2 wheel must be cleaned prior to final inspection. A shop blast machine is utilized for that process. The machine effectively

removes heat-treating scale and simultaneously peens the surface to an attractive luster.

As an added precaution during the early pilot stages of plant operation, a representative wheel from each heat was submitted to Magnaglo examination. Magnaglo is a patented process for detecting discontinuities in ferrous materials. These early precautionary examinations served merely to demonstrate that the X-2 wheel did not suffer significantly from plate defects susceptible to Magnaglo detection.

Machining—From the shot blasting station the wheel proceeds by gravity conveyor to the machining area. Two fully-automatic vertical turret lathes are presently set up for wheel machining and two additional are scheduled for future installation. In a single, cyclic operation requiring about 12 minutes, each wheel is automatically rough bored, finish machined on front hub and rim face, and precision turned to standard AAR steel wheel tread and flange contour with a secondary taper.

After machining, the wheel continues by gravity conveyor to the inspection station. Here it is weighed, stencilled to show tape size, and then meticulously examined by the resident inspector to check conformity to dimensional requirements as well as adherence to rigid standards of physical soundness and appearance. Finished wheels roll on a gravity monorail out to the shipping platform where they are picked up by lift truck and placed in storage. The inspector reviews all chemical and physical test records and heat treatment charts before releasing wheels for shipment.

Ideas for the Car Repair Man...

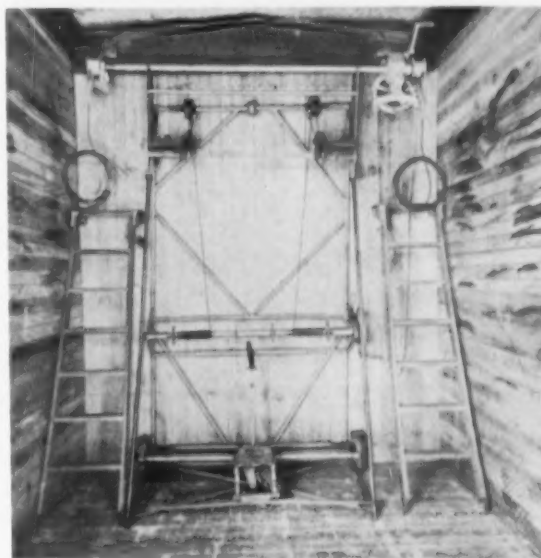
LIFTER FOR AUTO LOADER HOIST.—The application of Evans auto-loader hoists in automobile-box cars is greatly facilitated by means of the device illustrated. This is a welded tubular A-frame with one pair of legs vertical to fit closely up against the car end and the other legs diagonal for purposes of bracing and strength.

The frame is about 6 ft. wide by 9 ft. high and carries a sliding member with two upward-extending brackets notched at the top to support the auto-loader horizontal bar and keep it from rolling or slipping off the brackets.

The sliding member, or carriage, rides up and down the diagonal legs of the A-frame, as controlled by a simple hand-operated ratchet arrangement with duplicate small wire cables extending over suitable pulleys to the wind-up shaft. In its lowest position, the carriage is at a convenient height for easy application of the Evans hoisting unit and, in its highest position, the carriage supports the hoist horizontally about 10 ft. high and presses it against the holding brackets previously welded in place on the upper car end.

The holding bolts are then easily applied by one man on each side ladder who can bolt the hoist quickly and safely in place without having to hold it manually while lining up holes, inserting bolts and tightening nuts. The result is a definite increase in safety as well as saving of time and labor for this operation.

The A-frame is relatively light in weight and supported on three small truck wheels for easy portability, the center wheel having a slight vertical adjustment by means of the hand lever arrangement shown which permits the diagonal legs to rest on the car floor when



A—frame lifting device used in applying Evans loader hoists in auto-box cars.

necessary to prevent rolling. This device is used at the Southern Pacific shops, Sacramento, Cal., whenever an auto-box car building program is in progress, or for some reason an Evans auto-loader hoist has to be taken down or re-applied.

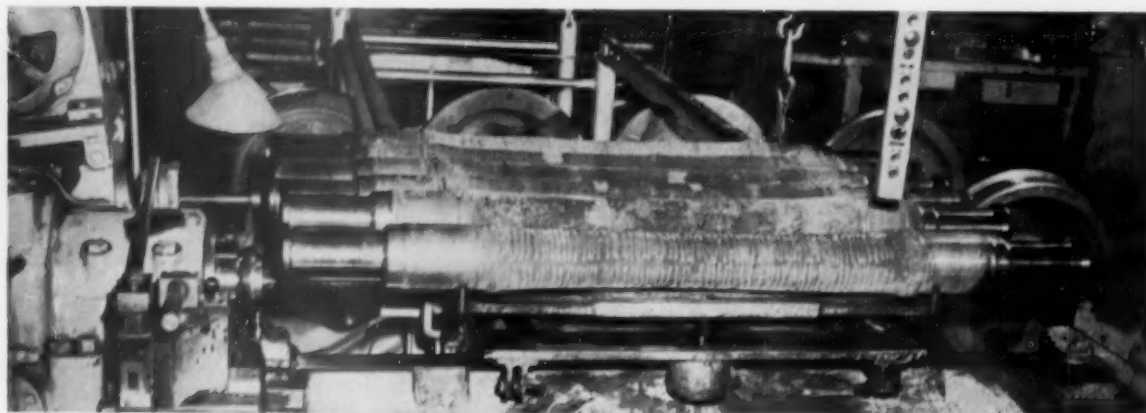


Axles are cleaned under a hood outside the shop.

AXLE CLEANING AND HANDLING.—Cleaning the preservative from axles at the Union Pacific's shops in Portland, Oregon, has become a simple operation. They are loaded onto a rack outside the shop, six at a time,

with a lift truck. From the rack, they roll into the cleaning compartment, where steam and cleaning solutions work on them for about 20 minutes. When released by the operator, they roll through the window and down in-

Ideas for the Car Repair Man...



From the cleaning rack outside the window, axles roll down an incline to the lathe.

clined rails to the axle lathe inside the shop. It used to take one man two hours to clean six axles by hand.

At the lathe, a pneumatically-operated carriage lifts

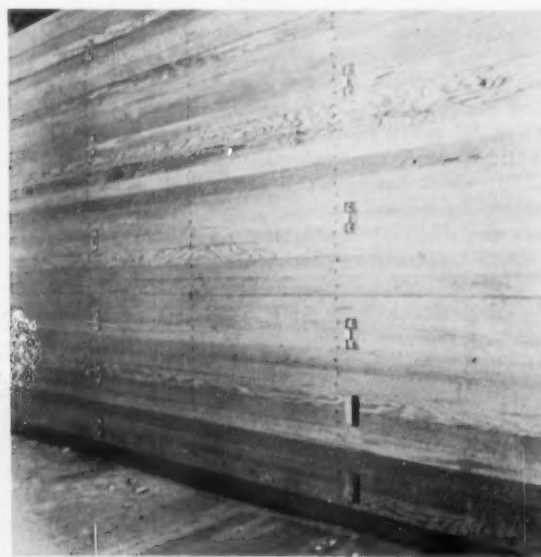
and places them in position for turning. They are removed from the lathe and transferred to the mounting press by a crane.



How template is applied in car while routing out recesses in inside lining for the application of Keystone loading anchors.

TEMPLATE FOR LOADING ANCHORS.—An interesting and efficient method of applying Keystone loading anchors to the interiors of box cars on the assembly line is illustrated. The template is made of aluminum with steel inserts at the rectangular openings for greater durability in guiding the 2-hp electrically-operated routing machine. The template is brought to the desired location, a bracket at the top hooking over the top lining board to assure the correct vertical position. The template is then positioned horizontally in line with the vertical sidepost and nailed lightly in place with 4 nails.

Operation of the router automatically and accurately



Keystone loading anchors riveted in place. Two bottom anchors are still to be applied.

cuts desired recesses in the inside lining to accommodate the Keystone loading anchors which are a close fit and driven home with a hand hammer. Each anchor itself serves as a guide for drilling rivet holes through the sidepost flange. The application of Pax Speedy blind rivets holds the anchors securely and permanently in place.

An educational program, intensive in character, is evidently necessary among shippers to assure wider acceptance and use of loading anchors which are available in several different types and with modern steel strapping, do much to reduce lading damage and reduce repair costs.

ELECTRICAL SECTION



The Olympian Hiawatha Speedliner pulled by a rebuilt gear-less locomotive leaving Seattle, Wash.

Old Electrification Meets All Corners

By L. WYLIE

Electrical Engineer

Chicago, Milwaukee, St. Paul & Pacific

and A. G. OEHLER

Electrical Editor, Railway Locomotives & Cars

■ Railroad electrification, generally considered since the advent of the diesel-electric locomotive to be economically feasible only under conditions of extremely heavy traffic, is paying its way on the Milwaukee.

By stepping up trolley distribution system voltage, improving power conversion substation equipment and arranging its automatic control, providing modern facilities for maintenance and repair of electric locomotives, overhauling electric locomotives, purchase of 12 heavy-duty, high-speed locomotives, securing a reduction in the rate paid for electric power, and by making other improvements, the Milwaukee is keeping its electrification, in spite of age and relatively light traffic, in pace with the diesels in efficiency and economy.

This situation has been possible because, while most of the electrification equipment has now reached or exceeded the assumed life, the actual condition of the equipment is

By making substations automatic, increasing line voltage and making other improvements, the Milwaukee electrification is meeting the greatly increased present-day demands for speed and power

such as to meet satisfactorily the greatly increased present-day demands for speed and power. This has been accomplished by changes and improvements in equipment and in operation listed here.

1. Trolley voltage has been raised from 3,000 to 3,400 volts at substations to compensate for voltage drop in the trolley distribution system. This increase was obtained by inserting soft iron shims under the main field poles of the d-c generators to reduce the air gaps from $\frac{3}{4}$ in. to $\frac{3}{16}$ in., thereby increasing the flux density of these synchronous speed machines. Some additional shunt field excitation of the generators is also required. The increase in trolley voltage has materially increased locomotive output without increasing electrical troubles on the line, locomotives or substations.

2. Substation equipment has been rehabilitated and



A three-unit locomotive pulls a freight train through Cle Elum, Wash. A line tower car may be seen in front of the substation

TABLE 1—COST PER 1,000 GROSS TON-MILES FOR ELECTRIC POWER AND ELECTRIC LOCOMOTIVE MAINTENANCE

FREIGHT TRAIN OPERATION ROCKY MOUNTAIN AND COAST DIVISIONS

STATISTICS	1947	1948	1949	1950	1951	1952	1953
Thousands GTM	3,296,459	3,354,933	3,193,389	3,520,283	3,416,041	3,363,201	3,159,959
KWH per MGTM	36.9	37.6	37.1	37.7	39.9	40.0	39.0
Cost per KWH							
Electric Power	\$.005422	\$.006392	\$.006435	\$.005940	\$.005470	\$.005390	\$.005380
Substation—Operation	.001600	.001660	.001837	.001832	.001819	.001950	.002020
Substation—Maintenance	.000511	.000389	.000411	.000398	.000590	.000543	.000695
Power Line—Maintenance	.000914	.000933	.001147	.000833	.000945	.001186	.001184
TOTAL	\$.009447	\$.009374	\$.009830	\$.009003	\$.008824	\$.009069	\$.009279

TABLE 2—AVERAGE PERFORMANCE OF 20 HEAVY TONNAGE TRAINS, ROCKY MOUNTAIN DIVISION

HANDLED BY CLASS EF-4 LOCOMOTIVES, SEPTEMBER 1953, HARLOWTON, MONT. TO AVERY, IDAHO

Train No.	Distance Miles	Number of Trains	Tons	Total Time* Hr Min	Terminal Delay Hr Min	Time Between Terminals Hr Min	Road Delay Hr Min	Running Time Hr Min	Miles per Hour
Train No. 263									
Harlowton—Three Forks	114.2	20	3,418	5-38	1-12	4-26	0-51	3-35	31.9
Three Forks—Deer Lodge	112.1	20	3,452	6-09	0-53	5-16	1-14	4-02	27.8
Deer Lodge—Alberton	110.8	20	3,553	5-47	2-55	2-52	0-10	2-42	41.0
Alberton—Avery	100.3	20	3,519	4-54	0-36	4-18	0-33	3-45	26.7
Harlowton to Avery	437.4	20	3,486	22-28	5-36	16-52	2-48	14-4	31.1
Train No. 264									
Avery—Alberton	100.3	20	5,715	7-23	2-1	5-22	0-53	4-29	22.4
Alberton—Deer Lodge	110.8	20	5,783	5-22	0-47	4-35	0-35	3-52	28.6
Deer Lodge—Three Forks	112.1	20	5,295	8-28	2-37	5-51	1-13	4-38	24.2
Three Forks—Harlowton	114.2	20	5,492	7-12	1-51	5-21	0-49	4-32	25.2
Avery to Harlowton	437.4	20	5,571	28-25	7-16	21-09	3-38	3-38	25.0

*Time of arrival at one terminal to arrival at next terminal

some manually operated substations have been converted to automatic operation.

3. Adequate shop facilities have been provided for maintenance of electric locomotives.

4. Troublesome spring cushion driving gears have been replaced with solid gears on 80 locomotive units. This change has improved locomotive performance, decreased the cost of traction motor maintenance and reduced the cost of maintaining the gear drives to a fraction of the former cost. Present electric locomotive maintenance costs are less than the maintenance costs of diesel-electric locomotives in the same service over any extended period of time.

5. Electric locomotives have been thoroughly overhauled for the first time. Some have been operated for 35 years, and have rolled up individual mileages of about two million miles.

6. Power line maintenance methods have been improved at the same time reducing the cost of line maintenance.

7. By using more horsepower per train, a great increase in both train tonnage and average train speed has resulted.

8. Revision of power contracts has secured a flat rate of approximately $\frac{1}{2}$ cent per kw-hr. Power paid for by the railroad is metered at substations at 2,300 volts.

A diesel-electric locomotive will develop approximately 10 kw-hr from one gallon of fuel oil—thus, if the cost of fuel is 10 cents per gallon, power cost for the electric locomotives, when line and conversion costs are included, is less than the cost of fuel would be for diesels (see Table 1).

As a result of these changes and improvements, the two electrified sections, 440 and 220 miles of line, respectively, are meeting stepped up operating requirements at a cost which justifies the continuation of electric operation.

Transmission and Distribution Performance

At least 90 per cent of the original 40,000 poles and 60 per cent of the original cross arms and attachments in the transmission line and distribution system are still in place. All poles have been stubbed with pressure-treated creosoted fir stubs, and all original wooden guy anchors have been replaced with reinforced concrete anchors.

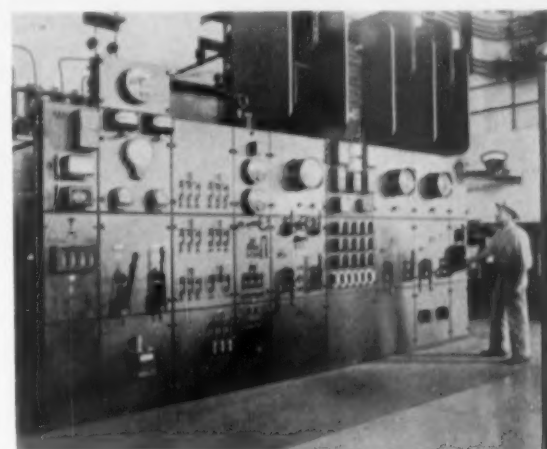
A considerable amount of corrosion of the trolley overhead has been experienced in all yards where steam locomotives previously operated, as well as from the summit of the Cascade range to Seattle and Tacoma. In this territory non-corrosive material has been installed where most needed. The rate of corrosion is being reduced as the use of steam locomotives is discontinued and as more non-corrosive material is applied. The original diameter of the 4-0 grooved copper contact wire was 0.432 in. The average diameter of this contact wire after 35 years of service is now approximately .430 in.

Contact wire is not removed from the line because of wear until it is reduced to a diameter of .360 in. By careful attention to pantograph maintenance and lubrication of trolley wire and pantograph shoes, the life of the contact wire can apparently be extended indefinitely.

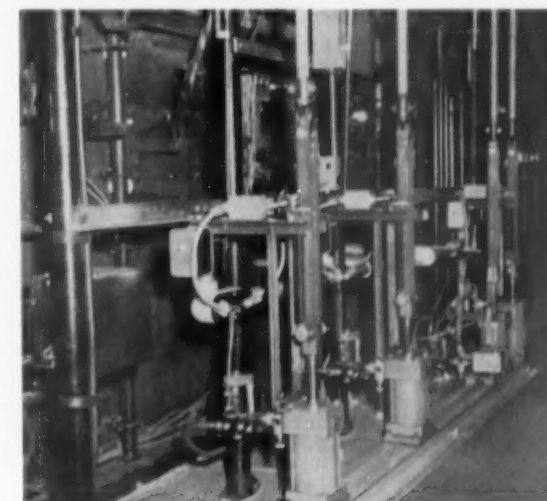
Many improvements in line maintenance methods have been developed, the latest of these being the highway-rail tower car truck. It may be run on the highway to any rail-highway crossing, where the retractable flange wheels are lowered by hydraulic cylinders so the truck can run to the work point on the rails. Practically all types of line main-



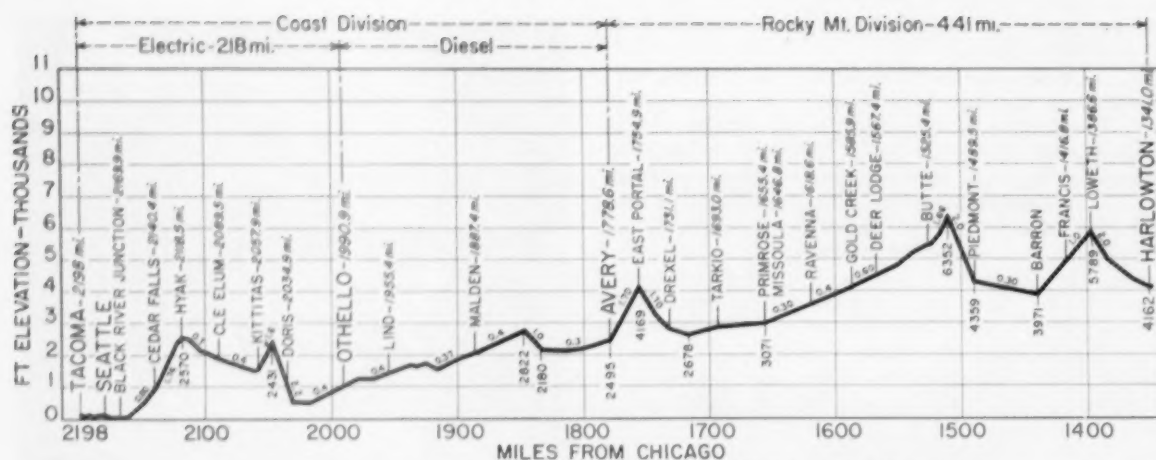
Motor-generator sets in the substation convert 2,300-volt 3-phase a-c power to 3,400 volts d-c.



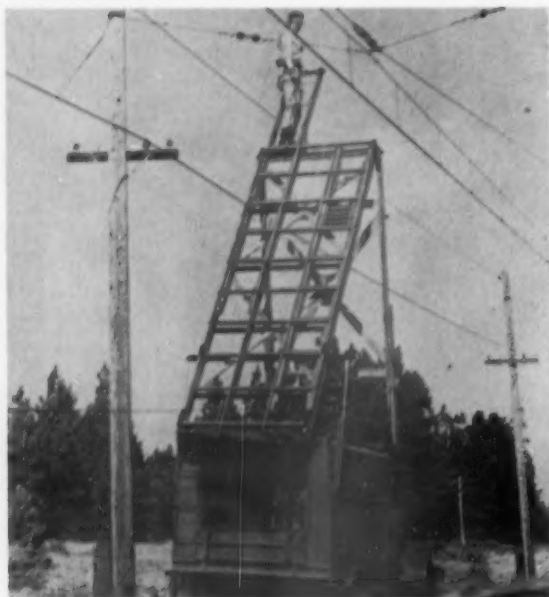
Manual switchboard in the Cle Elum, Wash. substation.



Substation's machinery is started, put on the line, taken off the line, and stopped automatically by electro-pneumatic operating mechanisms applied to the original breakers and switches.



Profile of the Milwaukee's electrified sections.



A highway-rail line maintenance car on the track with the tower or ladder raised.



A maintenance car leaves the highway for the rails.

tenance work may be performed with this truck. The work tower, or ladder, is made of treated spruce which has excellent insulation properties so that it may be used for "hot" work.

Of the 46 100,000/2,300-volt power transformers in substations, only 8 have been damaged to such an extent that new coils and complete overhauling were required. Most of the 46 synchronous, motor-driven generating sets have had minor repairs, but only about 25 per cent of these machines have been completely rewound.

Three Substations Now Automatic

There are 22 power-conversion substations, each of which was originally manually operated by three men, working three shifts. Three of these substations have been made automatic, and a number of the remaining stations will be converted to automatic operation.

This conversion is accomplished by use of relay-controlled electropneumatic mechanisms applied to existing switches and circuit breakers, and actuated either locally or by remote control. If desired, these mechanisms can be operated by relays adjusted to respond to the contact system voltage at the substation. When an overload persists for 15 minutes, the circuit breakers are opened, and machines shut down. When an approaching train causes reduction in line voltage, the motor generator sets are automatically started and connected to the line. To augment the regenerative capacity of some substations, power absorbing grids are used to assist with extremely heavy loads of short duration.

The amount of traffic handled over a 35-year period on the electrified sections is shown in Table 4 on next page.

TABLE 3—MILWAUKEE ELECTRIC LOCOMOTIVES NOW IN SERVICE

Number	Type	Description
1	EP3	Westinghouse passenger
2	EP2	General Electric bipolar passenger
3	EP4	General Electric #750-type passenger
4	EP1	General Electric 7-unit geared passenger
5	ES2	General Electric 80-ton switchers
10	EF4	General Electric #750-type freight
76*	EF1-2-3-5	General Electric geared freight

*Units—used 1, 2, 3 or 4 to a locomotive.



Interior of the electric shop at Deer Lodge, Mont.

In 1918, the schedule time for Train No. 16, the fastest passenger train between Avery, Idaho, and Harlowton, Mont., was 15 hr. The present schedule for that train, the "Olympian Hiawatha," is 10 hr 30 min.

In June 1918, the schedule for Train No. 64, the eastward time freight between Avery and Harlowton, with 2,800 tons trailing, the maximum tonnage at that time, was 36 hr 45 min. Today, with 5,800 tons trailing, the schedule for this time freight is 23 hr 30 min, and the train is making this schedule. Not all of the saving in time on this schedule is due to electrification, but the electrification system has been able to keep pace with changing times.

Passenger and freight train schedules, and freight train tonnage on the Coast division have been improved in like proportion.

Of the 62 bipolar locomotive traction motor armatures (60 in service and 2 spare armatures), there are still 10 armatures with original windings which have never had a failure of any coil. A record of the failures which have occurred on these armatures indicates that about 80 per cent have been caused by mechanical damage.

Majority of Armatures Rewound

Most of the armatures on the other locomotives have been rewound. Some of this was done on a program basis to remove windings which were assumed to be approaching the end of their life or to remove windings which had been damaged mechanically, or where moisture or dirt have caused an insulation failure.

Most of the classified repairs to electric locomotives are now being made in the railroad's shops located at Milwaukee, Wis.

All other locomotive maintenance functions including rewinding of motors, is done in the railroad's completely re-equipped shops at Deer Lodge, Mont., or in the shops at Tacoma, Wash.

A few locomotives have been scrapped, and 12 new locomotives were purchased within the past few years. Four electric-gear freight units were converted to two two-unit locomotives for passenger service.

From the results obtained to date from the program of classified repairs to electric locomotives which has been instituted, it is apparent that this program will materially improve performance and reduce maintenance costs to such an extent that the cost of repairs will be amortized in a relatively short period.

TABLE 4—TRAFFIC AND POWER CONSUMPTION, 1916 to 1953 INCLUSIVE

Gross ton-miles	95,710,157.000
Passenger car-miles	239,849,335
Electric power consumption (at 2,300 volts)	5,230,094.926
Cost of electric power	\$38,960,275*

*Varying prices for power have been paid over this period. The present rate on the Rocky Mountain division is a flat rate of 5.536 cents per kwh and on the Coast division it is 0.5 per kwh plus a charge for hourly power demand 5 to 6 p.m., 5 days per week during the period October 16 to February 15, inclusive, making the average yearly cost per kwh approximately 546 cents per kwh.



Airplane view of locomotive BB 9004 as it broke the world's rail speed record by reaching 207 mph.



Locomotive CC 7107 at the head of an express train on one of its regular runs.

Electric Locomotives Attain 207 MPH

■ Last year, on February 21, 1954, an electric locomotive of the French National Railroads, the CC 7121, running between Dijon and Beaune, broke the world's rail speed record by reaching 151.6 mph. This locomotive pulling 3 passenger cars, was one of a series of 60 locomotives built since 1949.

On March 28 and 29, 1955, the French Railroads broke their own record with two electric locomotives, the CC 7101, another in the same series as the 1954 record breaker, and the BB 9004. For the test runs, both these locomotives pulled the same three passenger cars, weighing 111 tons. The CC 7107 reached 198 mph, and the BB 9004 set the mark of 207 mph.

Tests were held on a 40-mile straight section of track in southwest France between Bordeaux and Dax, where a 1,500-volt, d-c system of electrification has been in operation since 1927. It was felt that the 40-mile stretch would allow sufficient distance for acceleration to high speed and braking, a special problem for high speed runs since applying brakes while traveling more than 125 mph was not considered safe. Special brakes had not been designed for the tests, and technicians decided that the windows would have to be lowered at the proper moment to create a drag. This system was used during the actual runs, and trains were successfully slowed down to safe braking speed.

Both locomotives used in the tests have been in regular service. The CC 7107, an entirely French-built locomotive manufactured by the Societe Alstom, has two six-wheel trucks, weighs 107 tons, and is of the type which regularly makes the Paris-Lyons run at an average of 76 mph.

Put in service in 1953, the BB 9004 is the result of group cooperation between Creusot, Schneider-Westinghouse and Jeumont. It has two four-wheel trucks, weighs about 83 tons, and has about 300 hp less than the CC 7107. The BB 9004 is a prototype of the latest locomotive design developed by the French to serve its 1,500-volt, d-c lines for high speed runs. Forty locomotives of this type are under construction.

Since the lighter BB 9004 costs about 25 per cent less than the CC 7000 series, the French were eager to discover if its performance would compare favorably with the very successful CC 7000 locomotives.

To adapt the transmissions to the high speeds, slight

Tests on French National Railways develop new information on very high-speed operation

modifications were made in the gears of the two locomotives, and solid wheels were used to avoid the effects of centrifugal force and braking on tired wheels. It was estimated that the locomotives would develop about 10,000 hp at 185 mph, and a special pantograph was designed to collect 4,000 amp at high speed. An aviation wind tunnel was taken over to allow examination of how a 185-mile wind would effect pressure of the pantograph on the catenary. Elaborate safety measures were taken, including complete shop tests of all moving parts, which were made to revolve at a speed simulating 260 miles per hour in actual operation.

The three passenger cars attached to each locomotive for the speed tests were virtually unchanged. However, it was necessary to remove all seats from the first car to accommodate the instruments and equipment used to measure the effects of speed on all parts of the train and track. The test train carried a piezo-electric quartz accelerometer to test stability and lateral strain, registered on cathodic oscillographs, various precision instruments to measure speed, time, and line voltage, plus, as a final touch, a periscope through which engineers could watch that the pantograph was in constant contact with the catenary. The rear of the last passenger car was specially streamlined to assure the best possible air flow.

The CC 7107 was tested on March 28 and the BB 9004 on March 29. After 13 miles, the CC 7107 was running at 180 mph, and was allowed to reach 198 mph. The BB 9004 accelerated at about the same rate, but climbed to 207 mph. Soon after the BB 9004 reached record speed, trouble developed in its rear pantograph, a result of the heat created by high speed. The front pantograph was raised, and the rear one lowered while the train was traveling at 198 mph. Although the CC 7107 apparently did not affect the rail, a standard French track unaltered for the tests, it was found that the BB 9004's top speed of 207 miles caused slight damage. A principal reason for conducting the tests was to determine if guiding trucks are necessary for high speeds, and the results indicate they are not. Both locomotives developed 12,000 hp.

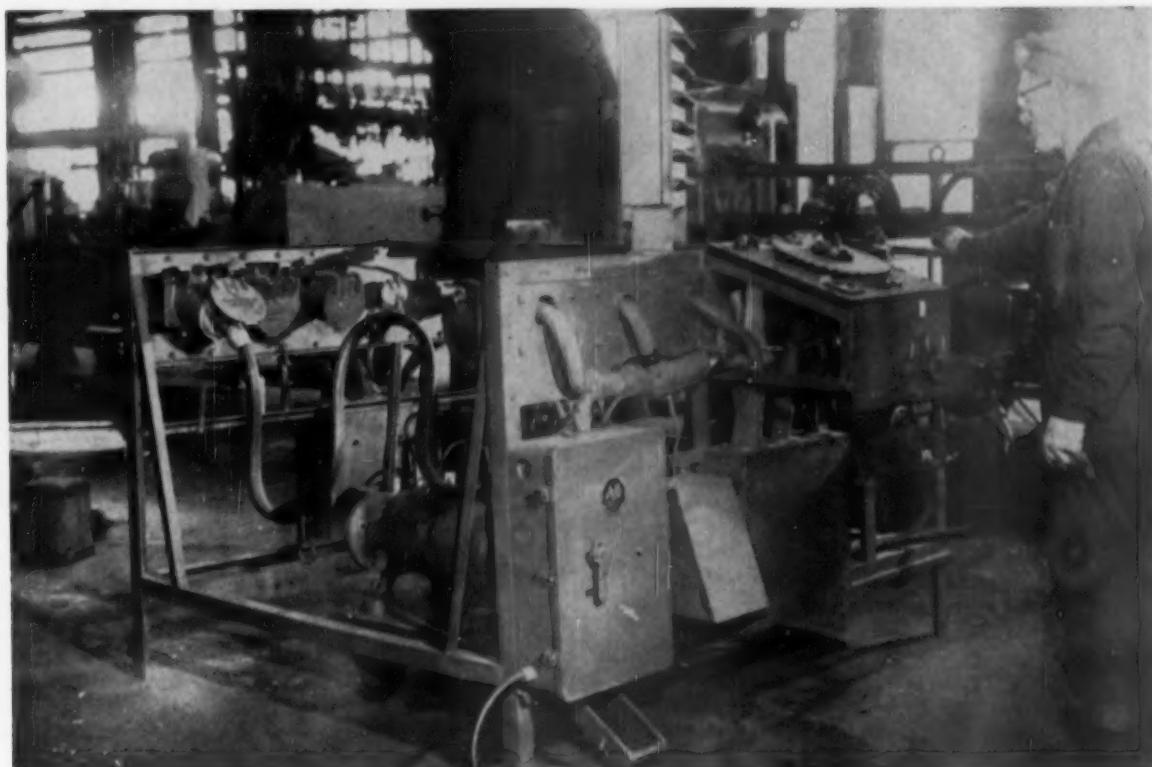


Fig. 1—The Rock Island jumper tester in operation

Rock Island Develops Jumper Tester

■ While diesel locomotive jumper cables, both m-u and brake, are oscillated by a motor drive, tests for current carrying capacity, shorts between conductors or grounds, and for quality of insulation are made on a jumper tester developed in the Silvis, Ill., shops of the Rock Island. The machine is also equipped for checking sequence of connections.

Three sources of power are used for the different tests. One provides 85 amp at about 8 volts for load testing, another is 500 volt d-c for insulation resistance testing and the third is 110-volt a-c power for sequence testing. Any one of the three may be selected by means of the three-point switch on the front of the control box shown at the right in the above illustration.

The 85-amp, 8-volt source is an auto transformer which was once a 50-hp motor starter. A resistance in series with the secondary limits the current to 85 amp. The 500-volt d-c source for insulation testing is a step-up transformer and a full-wave tube type rectifier. Interlocks prevent applying the wrong kind of power for any one of the tests. During the insulation and current capacity tests, a motor-driven oscillator moves the cable back and forth at 30 oscillations per minute through an arc of 14 inches.

For the current capacity tests, the jumper is plugged into a receptacle at the front of the testing rack and another receptacle at the rear. A short-circuiting switch is used to connect all the conductors of the cable together at the rear receptacle.

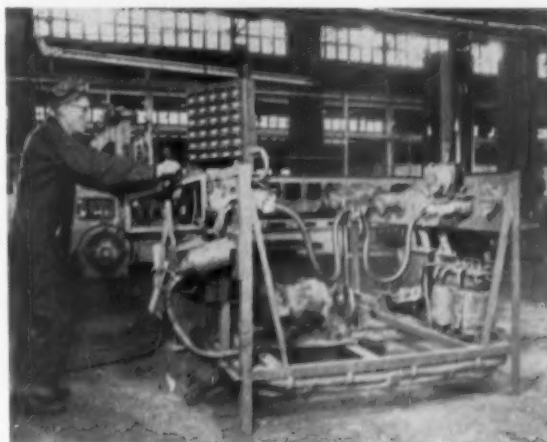


Fig. 2—A side view of the tester showing the sequence lights in front of the operator and the motor-driven cable oscillator

The 8-volt, 85-amp source of power is applied in turn to each jumper conductor at the front end by ratcheting the selector switch on top of the tester control box, from one conductor to another. When the connection to a conductor is made, the 85 amp current flows for 8 seconds when it is cut off automatically by an out-fire relay taken from a Vapor steam generator. The value of

Westinghouse

Four 100-hp motors with current-limit control driving through flexible couplings provide acceleration and dynamic braking rates of 2.5 and 3.0 miles per hour per second

By W. L. Barclay

Transportation Engineering Supervisor
Westinghouse Electric Corporation
New York, N. Y.

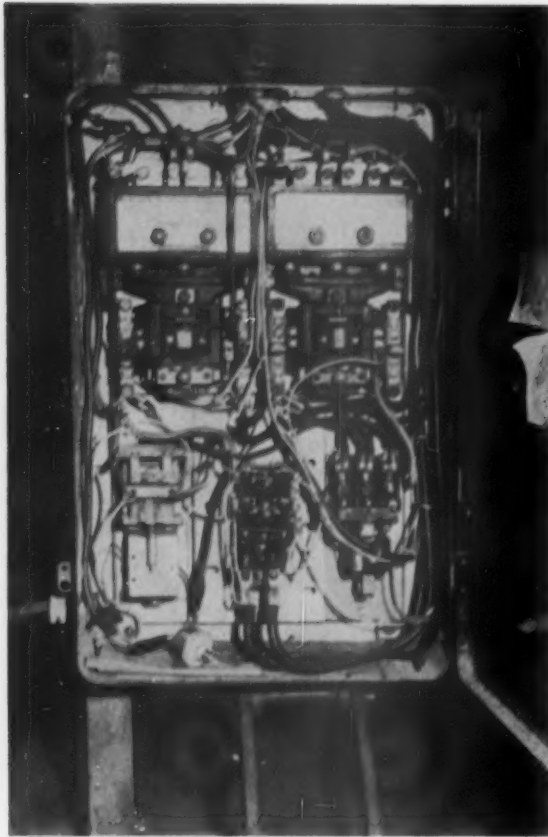


Fig. 3—Relay and connection panel which is located as shown at the lower left in Fig. 1

time and current were selected so that if 14 or more strands of 105 stranding are unbroken in the conductor, they will burn off, and open the circuit. A timer light comes on as each conductor comes under test, and goes out when the out-fire relay opens the circuit. An OK circuit light also comes on when the circuit is closed, and if it goes out before the timer light, it indicates an open or burned-off conductor.

For the insulation and ground test, the connections at the rear receptacle are left open and 500 volts d-c is applied to each conductor in turn by the selector switch. A milliammeter in the lower left-hand corner of the control box, shows the amount of leakage current from each conductor, to ground or to other conductors, as the selector switch is notched around.

If the current flow exceeds $\frac{1}{2}$ milliamperes, a ground indicating light shows. The value of $\frac{1}{2}$ milliamperes is equivalent to 1 megohm resistance and is the limit for acceptable insulation.

For the continuity test, one end of the jumper conductors is connected in turn to the 110-volt a-c source. The other ends of the conductors are connected by means of a switch to the lights in the panel at the top of the machine in front of the operator,—one light for each conductor. Then as the selector switch is ratcheted from one point to the next, each light shows in turn if all connections are correct.

All types of electric brake and m-u jumpers are tested in the machine.

■ In 1948, the modern trend for heavy duty rapid transit equipment was established when the first of 750 new cars were delivered for service on New York City subways. These cars set new standards for passenger movement, schedule speed, acceleration and braking rates. The car body design features an attractive interior, contour seats, wide doors, fluorescent lighting and excellent riding qualities. This car has proved to be an efficient design from the standpoint of both the passenger and the operator; the passenger because he gets faster, more comfortable and more reliable transportation; and the operator because he can provide service with fewer cars at faster schedules and because of easier handling, safer operation and extension of mileage between inspections. The features called for in this design were decided on after extensive engineering studies under the former Board of Transportation and the present New York City Transit Authority by Col. H. S. Bingham and his assistants. The soundness of the basic design is attested to by six years of eminently successful operation and by the fact that essentially duplicate performance is specified for the 600 additional cars now on order and now entering service.

To the electrical equipment manufacturer the ultimate test of design sufficiency is service performance. Therefore, each electrical component on the earlier cars was subjected to the closest scrutiny, with attention directed equally to electrical and mechanical design. The results of this survey, which is based on approximately 100,000,000 car miles of operation on Westinghouse equipped cars, clearly indicated that all major electrical components successfully withstood the test of time and heavy duty service. Such design changes are largely detail refinements or the use of newly developed materials. In addition the grouping of apparatus has been changed to reduce the number of individual boxes to be mounted.

Electrical Components—Main Drive

Westinghouse electrical equipment was supplied on 375 of the 750 cars delivered from 1948 to 1950, and 300 additional cars are currently entering service. On these latest cars the major electrical components have been retained. The main drive equipment consists of: four 100-hp, 300-volt traction motors connected two in series; four separate gear units with oil lubrication and with the gear centers accurately maintained by tapered roller bearings on both

Equipped Cars For New York Subways



Side view of a complete R-16 car

high speed and low-speed shafts, and four flexible couplings of the internal gear type connecting each motor to its gear unit.

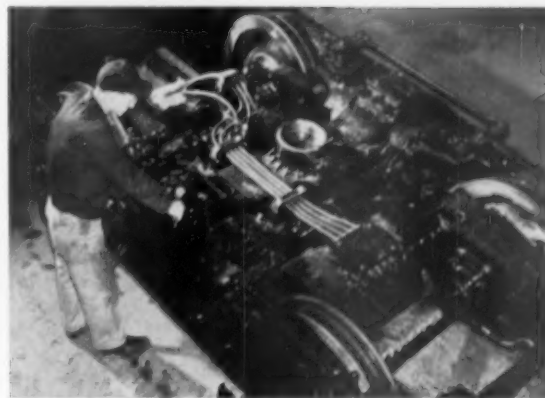
This arrangement is superior to the older axle hung motor drive because it permits the use of the high-speed motor with its more efficient ventilation and lighter weight; because of quieter operation inherent in separate oil lubricated gear unit, and because of less unsprung weight on the axle with consequent improvement in riding qualities. While there is no essential difference in outward appearance of the drive components for the new cars, a number of advances have been made in detail design. Among these are an improved means of obtaining an accurate "Dy-netric" balance of the motor armature, improved motor insulation through the use of new materials and processes, and slight modifications of the gear case design to facilitate disassembly and to prevent oil leakage.

Control

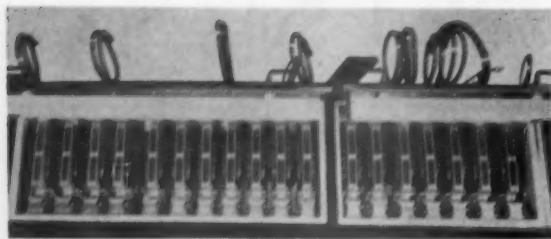
On both the 1943 cars and the current order the control equipment provides series-parallel control, field shunting for the high speed power connection, and dynamic braking. The acceleration and dynamic braking rates are 2.5 and 3.0 respectively. To accomplish this both groups of Westinghouse-equipped cars make use of electro-pneumatic unit switches and external self-ventilated ribbon resistors of rugged construction for acceleration and dynamic braking notches. Field control is obtained by means of a multi-notch cam controller which provides smooth transition between full field and short field notches and maintains commutation stability of the motors while field strength changes are taking place. The transition from series to series-parallel connection of the motors is made by the bridging method which maintains full motor torque during transition. This is of special importance wherever high accelerating rates are used in order to maintain smooth continuity of rate for the comfort of the passengers. Notching for both acceleration and braking is ac-



Interior view of an R-16 car



Top view of complete R-16 Truck with motor and gear unit



Side view of Westinghouse package control unit with cover raised



A model of the centralized traffic control board which will provide pushbutton control for the entire IRT system of train movements and signals. Shown with the board are Col. Sidney H. Bingham (right) executive director and general manager, New York Transit Authority and Edward O. Boshell, chairman and president, Westinghouse Air Brake Company, which company is supplying the equipment through its Union Switch and Signal Division

complished by interlock progression of switches under the control of a limit relay. This system has the advantage of reliability and simplicity with the result that inspection, sequence checking, trouble shooting, etc., are easily understood and present no problems to maintenance or operating personnel. From the maintenance standpoint the unit switch construction lends itself to orderly shop procedures without the necessity of handling or dismantling large pieces of control equipment. Numerous refinements have been incorporated to further improve performance and ease of maintenance. One of the principal items in this category is the grouping of virtually all the undercar control together into a single unit containing line switches, unit switches, relays, motor generator control and pneumatic devices for coordinating the air brake with dynamic braking.

Such a unit has a number of advantages:

1. Factory wiring and test of the complete control.
2. Elimination of separately mounted boxes with their individual connections, conduit runs and clearance space requirements.

3. The grouping together of pieces of similar polarity.
4. Increased accessibility for inspection and maintenance.
5. A considerable weight advantage to the single unit construction.

Performance-wise the new cars have a marked advantage over previous subway equipment. The current build-up during the initial portion of the acceleration or braking cycle is cushioned in such a way that the car attains its ultimate steady rate on a smooth, sweeping curve. The advantages of such a build-up characteristic are obvious for both the riding public and the operator. It provides for the passenger, particularly the standee, an easier, more comfortable ride; and for the operator, reduced maintenance due to lower impact stresses at starting and when brakes are applied.

Car Ventilation

An innovation in the new car design is introduced in the use of six Railvane fans for more efficient ventilation. This system employs variable speed of the fans under thermostat control, combined with careful design of plenum chambers and fresh air intakes for proper mixture and proportions of outside air and recirculated air. With this ventilating system, the air movement is well distributed throughout the car and the volume of air circulation is automatically increased when the temperature within the car tends to rise. This represents an important advance in passenger comfort under all-weather conditions, since the fans will be used for air circulation in winter as well as summer.

Interchangeability of Parts

With the introduction of new car equipments, there is inevitably the question of how many new parts are involved and how great an increase is required in storeroom space and inventory. The storekeeping problem is a matter of real importance to the operating company, but happily this does not present a major problem for these 300 new cars, because the electrical equipment duplicates the apparatus so successfully used on the previous orders. The design changes made are centered chiefly on the regrouping of apparatus and providing better accessibility, which does not affect the component parts. Wherever the design of detail parts is changed, the new parts can, in general, be used on the older cars so that the number of additional parts to be stocked is held to a minimum.

As these new cars take their place in the busy rapid transit service of New York City, they introduce advances in car design and electrical equipment which once again raises the standard for heavy duty metropolitan subway cars.

To the operator, the tangible advantages are improved equipment layout, apparatus designed for rugged duty, automatic operation with simple straightforward control circuits, lower maintenance and the ability to operate for longer periods between inspections.

For the riding public the new cars provide more rapid loading, and easy start and smooth braking build-up, and a fully engineered car ventilation system for year-round use.

For the metropolitan area, the new cars represent another step in the long range program for improving rapid transit facilities.

*The best drop bottom
combination..*

**REDUCES DEAD WEIGHT
..CUTS LABOR COSTS!**



Spring Hinges and Adjustable Locks

ADAPTABLE TO ALL DROP BOTTOM GONDOLAS

Wine Drop Bottom Locks and Spring Hinges have long been established as the practical method for drop bottom closure. Basic simplicity and ruggedness of the mechanism requires little or no servicing, and the accessible method of adjustment on the individual lock assures positive door fit.

Featuring single door operation, any or all

doors open as required to control lading distribution. Maintenance-wise, a single door and mechanism may be dismantled without disturbing adjacent doors. The Wine Drop Bottom Combination offers all the important improvements—individual door fit, minimum maintenance, and easy, one man selective operation.

THE WINE RAILWAY APPLIANCE CO., TOLEDO 9, OHIO

Questions and Answers

Car Heating Systems

This group of Questions and Answers has been prepared by the Vapor Heating Corporation and pertains primarily to problems associated with Vapor equipment. This is not part of a series but additional material of this type will be published when available—Editor

Q—What is the recommended location of the one thermostat in a coach equipped with a Vapor Unizone heating system?

A—The heat thermostat of the Unizone heating system should be about 68 inches above the floor and about two inches from the aisle edge of the cross partition in the car at the same end of the car where the circulating fans are located.

Q—Why is this the recommended location for the thermostat?

A—Because it is important that the air around the thermostat is an accurate sample of the temperature in the seating area of the car.

Q—Is air distribution an important factor in keeping an even, comfortable temperature in the car?

A—Yes, proper air distribution is very important because the air nearest the overhead radiator is warmer than the air at the far end of the overhead air duct. Therefore, more warm air must be released at the far end of the duct in order to distribute the heat evenly in the car. For example, if overhead air distribution is such that a large percentage of heated air is released at the first two or three duct outlets the thermostat will be adversely influenced and a definite temperature differential will be reflected in the whole car. It is generally true that when the air is properly distributed for cooling it is also properly balanced for heating.

Q—Is a small degree of pressurization desirable in passenger cars?

A—Yes, because it helps to eliminate drafts caused by doors being opened, as well as keeping warm air pressed against unavoidable leaks. Pressurization also keeps dirt from filtering into the car.

Q—With a Unizone heating system how is the heat release balanced between overhead and floor radiation?

A—By the proper setting of the adjustable orifices in the two Vapor balancing manifolds for floor heat, and the Vapor balancing orifice in the supply line to the overhead radiation. This is necessary to distribute the steam in the right proportion to keep the whole car at an even temperature. Once adjusted the orifices are locked in position and should not be changed.

Q—What is the recommended location on the car for the one Vapor steam regulator?

A—Between the overhead riser and the center of the car, preferably not more than 15 ft from car center.

Q—How often is it recommended that a Vapor Steam Regulator No. F968 be overhauled or changed out?

A—Once every 18 to 24 months each regulator should be changed out and replaced by a regulator that has been repaired and tested at a central repair point.

Q—How does one test the electrical circuit operating the

Unizone Heating System?

A—By pushing the test button on the control panel, when the thermostat is calling for heat. By doing this the maintenance man can observe the action of the relay and check the opening and closing action of the safe control valve on the steam regulator.

Q—How is wash water heated on a car equipped with Unizone Heating System?

A—A spring loaded check valve is built into the Vapor Unizone Steam Regulator that supplies a continuous flow of steam to the hot wash water heater exchanger, regardless of whether or not steam is being used to heat the car.

Q—Is Vapor Unit-Fin floor radiation made for and used in railroad cars different from regular fin radiation used to heat buildings?

A—Yes, Unit-Fin radiation is made with the steam feed pipe inside the pipe with the fins. Steam enters the inner pipe and goes to the far end of the section of radiation, then into the outer pipe, this done to release heat evenly along the full length of radiation and eliminate the need of a return line.

Q—Is the steam positively off when the cooling system is operating?

A—Yes, the safe control valve in the Vapor Steam Regulator opens and by-passes steam back to the regulator. The outlet check valve provides a positive shut off to keep steam vapors from entering heating radiation during the cooling period.

Q—In case of electrical failure can the car still be heated?

A—Yes, the steam is automatically fed to the heating system when current is not available, the amount of heat may be manually controlled by a valve in the car.

Q—Is it necessary to have a reducing valve in addition to the Vapor Steam Regulator?

A—No, because a reducing valve is built into the Vapor Steam Regulator that reduces the train line steam pressure which may be up to 250 pounds pressure, down to 50 pounds pressure, then the safe control portion of the steam regulator reduces the steam pressure down 12 pounds pressure which is the maximum pressure that steam is allowed into the radiator when the thermostat calls for heat.

Q—From the above question does this mean that the Vapor Unizone Heating System is a 12 pound pressure steam heating system?

A—No, the system works on ounces of pressure in mild weather up to 12 pounds pressure in very cold weather. When the thermostat calls for heat the regulator feeds steam through the radiator and back to a thermo-sensitive bellows in the regulator which operates in such a way as to control the amount of steam fed to the radiator.

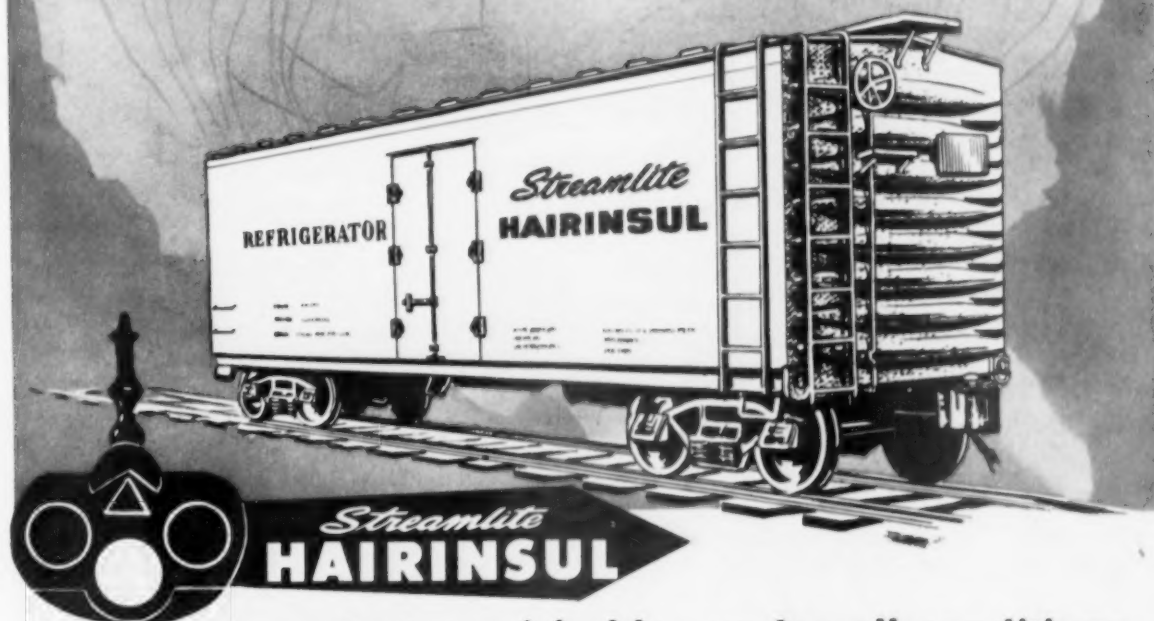
Q—Why is it desirable to have all radiation condensate return to the Vapor Steam Regulator?

A—In order to eliminate steam traps, and it is better to release heat condensate from one central point.

Q—What size pipe is recommended for the heating system?

A—All under car piping between the Vapor Steam Regulator and the radiation should be 1 in. IPS or 1 1/8 OD copper tubing.

chart your own WEATHER CONTROL



**Streamlite
HAIRINSUL**
protects perishables under all conditions

- **LOW CONDUCTIVITY.** Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity - .25 btu per square foot, per hour, per degree F., per inch thick.
- **LIGHT WEIGHT.** Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.
- **PERMANENT.** Does not disintegrate when wet, resists absorption. Will not shake down, is fire-resistant and odorless.
- **EASY TO INSTALL.** Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall sections between fasteners.
- **COMPLETE RANGE.** STREAMLITE HAIRINSUL is available 1/2" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings are available.
- **HIGH SALVAGE VALUE.** The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

Shipments of valuable perishables are at the mercy of extreme temperature changes unless properly protected. Only an efficient refrigerator car insulation can reduce this hazard.

Leading refrigerator car builders recognize this. That is why, for the better part of a century, they have been specifying all-hair insulation. They know that STREAMLITE HAIRINSUL is the one insulation that is fully efficient under all weather conditions - hot or cold - no matter how severe.

Other reasons why car builders specify STREAMLITE HAIRINSUL are listed at the left. These are just a few - there are more. Write for complete data.

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SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED

Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

(Manual 2310, page 401)

G197-Q—Describe the steps to be taken when filling the system.

A—(1) Stop engine; (2) open filling level valve G; (3) fill slowly until water runs out filling level pipe at valve G2; (4) close filling level valve G.

G198-Q—What additional step should be taken if filling a dry or nearly dry engine?

A—Start the engine and run for several minutes.

G199-Q—Why is this done?

A—This will eliminate any air pockets in the system.

G200-Q—What further steps should be taken?

A—(1) Shut down engine, open valve G and wait three minutes; (2) add water until it runs out filling level pipe; (3) close filling level valve G.

(Manual 2310, page 403)

G201-Q—What precaution must be taken in case a hot engine cooling system has been drained?

A—Do not fill immediately with cold water.

G202-Q—Why is this precaution necessary?

A—The sudden change in temperature might crack or warp the cylinder liners and heads.

G203-Q—What additional precaution must be taken when filling the cooling system?

A—(1) Do not attempt to fill the cooling system through the drain pipe located underneath the locomotive; (2) the system should not be filled above the maximum water level indicated on the water tank.

G204-Q—Why is this precaution necessary?

A—(1) To prevent freezing of radiators in winter; (2) to prevent loss of rust inhibitor when draining back to G valve level.

Lubricating Oil System

G205-Q—How is the engine lubricated?

A—Oil under pressure is forced through the engine for lubrication and piston cooling by the combination piston cooling and lube oil pump.

G206-Q—What becomes of lube oil which falls into the oil pan?

A—Lube oil which falls into the oil pan is picked up by the scavenging oil pump and forced through the oil filters and cooler to the oil strainer housing, where it is ready for recirculation by the oil pump.

G207-Q—What becomes of the excess oil?

A—It returns to the oil pan where it is held until used.

Oil Level

G208-Q—When may the oil level be checked?

A—The oil level may be checked with the engine running at any speed.

G209-Q—How should the oil level read?

A—Between LOW and FULL on either bayonet gauge (one on each side of engine).

G210-Q—What happens when the engine is stopped?

A—When the engine is stopped, the oil from the filter and cooler will drain back into the oil pan.

G211-Q—In this case what should be the indication on the dip stick?

A—The indication on the dip stick should show SYSTEM CHARGED.

G212-Q—What is the marking SYSTEM UNCHARGED used for?

A—It is used by maintenance forces at the time new oil filter elements are installed.

Adding Oil to the System

G213-Q—When adding oil to the system, which opening is used?

A—The oil must be poured through the opening having the square cap on top of the strainer housing.

G214-Q—Why should the round caps never be used (removed for filling) while the engine is running?

A—Hot oil under pressure will come from the openings and possibly cause personal injury.

G215-Q—Why is the level SYSTEM CHARGED, below the SYSTEM UNCHARGED level?

A—Because some oil is trapped in the lube oil filter, oil lines and engine.

Oil Pressure

G216-Q—What normally is the oil pressure at 800 rpm?

A—Normally 35 to 45 pounds.

G217-Q—What should be the minimum?

A—It should not drop below 20 pounds.

G218-Q—What should the oil pressure be at idling speed?

A—At idling, the pressure should be at least 6 pounds.

G219-Q—What takes place in the event of dangerously low oil pressure?

A—The engines will automatically be stopped.

Fuel Oil Systems

(Manual 2310, page 405)

G220-Q—How is fuel in each unit circulated?

A—Fuel in each unit is circulated through the injectors by an electric driven fuel pump.

G221-Q—What, in the fuel system, can cause fuel failure?

A—Failure of pump to operate, closed emergency fuel cut off valve or clogged strainer.

Fuel Flow

G222-Q—What would be the indication of proper engine operation?



2 MINUTES AFTER FLOWING ON PENNSALT CLEANER 23, the paint has blistered and is beginning to sag away from the base metal.

3 MINUTES AFTER FLOWING ON PENNSALT CLEANER 23, only the bare metal is left. The 4 coat standard freight car paint film has been completely removed.

This powerful alkaline cleaner strips paint to bare metal in 3 minutes

PENNSALT CLEANER 23

Pennsalt Cleaner 23 is an extremely active alkaline cleaner with a strong affinity for painted surfaces. It strips the thickest paint film to bare metal in minutes without the usual streaks and residue.

Pennsalt 23 is a *free-rinsing* stripper. This property not only helps the loosened paint run off in sheets, but also simplifies the problem of getting the metal surface ready for re-painting.

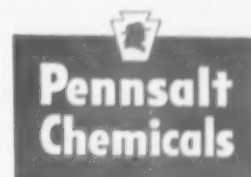
If you want to speed your own paint removal processes, use Pennsalt

Cleaner 23. It will remove up to 25 coats at one application. If you have a combination of paint, caked grease and road grime to get off, this cleaner will remove all three at the same time. Whether you use soak tank or spray methods, you save both stripping and rinsing time with Pennsalt 23.

For more information, see your Pennsalt Railway Maintenance Specialist. Or write: Pennsylvania Salt Mfg. Co., Railroad Maintenance

Dept. EAST: 1083 Widener Bldg., Philadelphia 7, Pa. WEST: Woolsey Bldg., 2168 Shattuck Avenue, Berkeley 4, Calif.

Favorite of the men in the shops



Chemical Progress Week May 16-21

Questions and Answers

A—A good flow of fuel (clear and free of bubbles) should be indicated in the fuel return sight glass.

C223-Q—Where is the fuel return sight glass located?

A—On the duplex filter assembly, nearest the engine.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F192-Q—Suppose that the engine load tends to fall below the rated figure for any engine speed?

A—In this case the load control pilot valve will cause the load regulator to decrease the resistance or move toward maximum field.

F193-Q—Does this constitute a torque control?

A—No. The centered position of the pilot valve is dependent on speed setting and not on the actual engine speed.

Indicator Scales on the Governor

F194-Q—Describe this feature.

A—On the outside of the governor are two pointers with scales. One is marked SPEED and markings correspond to throttle position. The other is marked FUEL and indicates power piston position in sixteenths of an inch.

F195-Q—How is the fuel scale reading calculated?

A—The lower the fuel scale reading, the more fuel is being injected into the engine.

Over-riding Solenoid in Governor

F196-Q—How is the over-riding solenoid energized?

A—By either wheel slip relay.

F197-Q—What is its function?

A—It operates to send the load regulator to minimum field by control of oil flow.

Governor and Load Regulator Indications for Correct Loading

F198-Q—How can a quick check be made for correct engine loading at full throttle?

A—By observing the load regulator and the pointers on the governor.

F199-Q—Why should this check be made at full throttle?

A—Variations at part throttle may cause confusion.

F200-Q—Where should the governor speed pointer be with throttle in run 8 position?

A—At 8 to coincide with the throttle.

F201-Q—Where should the governor fuel pointer be?

A—Governor fuel pointer should be at 6.

F202-Q—What would a higher reading indicate?

A—Insufficient fuel to the engine.

F203-Q—What would a lower reading indicate?

A—Indicates excessive fuel to the engine or that fuel pressure to engine is low.

F204-Q—Where should the load regulators in each unit be?

A—Load regulators in each unit should be between 9 and 5 o'clock.

F205-Q—What is the trouble if the arm stays at 7 o'clock?

A—Unit is at minimum field, indicating governor trouble, or that engine is starving for fuel.

F206-Q—What is wrong if the arm stays at 5 o'clock?

A—Unit is at maximum field, indicating governor or electrical trouble.

F207-Q—What procedure should be followed in case the observed readings indicate governor trouble?

A—A report should be made for correction. Do not attempt any adjustments on road.

Schedule 24 RL Air Brakes

1837-Q—What is the result of this bucking action?

A—This bucking action results in loss of flux required to hold the relay in its energized position, and it therefore drops out.

1838-Q—Describe this action further.

A—Relay T by this means can recognize that the brakes are applied and so disconnects the battery supply from the head end of the two Wheatstone bridges by its contact B3-B4, and opens the connections from the bridges to the application and release wires by its contacts C1-C2 and C3-C4.

1839-Q—In the application of the circuit checking equipment to the train line circuits what must be checked?

A—The wiring to the master controller as well as the wiring to the magnet valves in the train.

1840-Q—Where is this shown?

A—This is shown in Plate 17.

1841-Q—What is the first thing to be done?

A—First, it is necessary to check that the battery supply to the master controller is intact.

1842-Q—How is this done?

A—This is done by arranging the circuits so that it is impossible to get B to the circuit checking equipment unless it has first gone to the master controller.

1843-Q—Describe the arrangement as shown in Plate 17.

A—The top line in Plate 17 is the B+ supply, and it will be found that this wire is first connected to terminal 4 of the master controller, then to terminal 3, and then to terminal of circuit checking equipment.

MET-L-WOOD

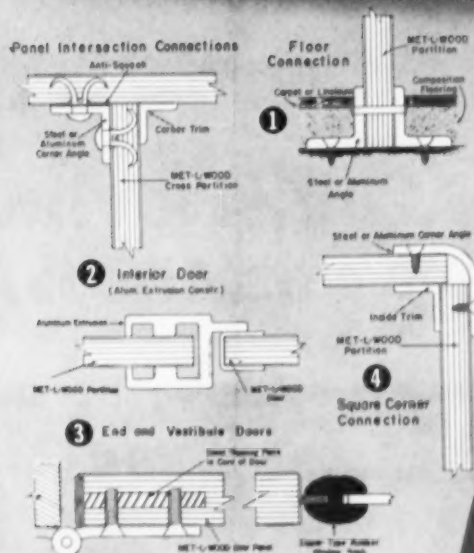
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FOR MODERN CAR INTERIORS



Met-L-Wood walls provide a smooth, luxurious finish in addition to saving weight and simplifying construction.



MET-L-WOOD passenger car partitions, doors and paneling not only produce beautiful finished surfaces, but can also save up to 73%* in weight and a substantial amount of construction time. Shown at left, and described below are typical Met-L-Wood construction details. Full information on Met-L-Wood versatility in new or rebuilt cars will be furnished promptly on request. Write today.

- ① Panel intersections with Met-L-Wood can be made invisible from outside with the use of split rivets. Floor connections may be made in a variety of ways, one of which is shown here, using through-rivets and metal screws.
- ② Interior doors of Met-L-Wood can be fitted with aluminum extrusion door stops; or the Met-L-Wood partition formed so that the door stop is an integral part of the panel.
- ③ Steel tapping plate inserts can be put in Met-L-Wood doors at proper places for solidly anchoring hinges and door-opening devices. Note simplicity of using zipper-type window openings.
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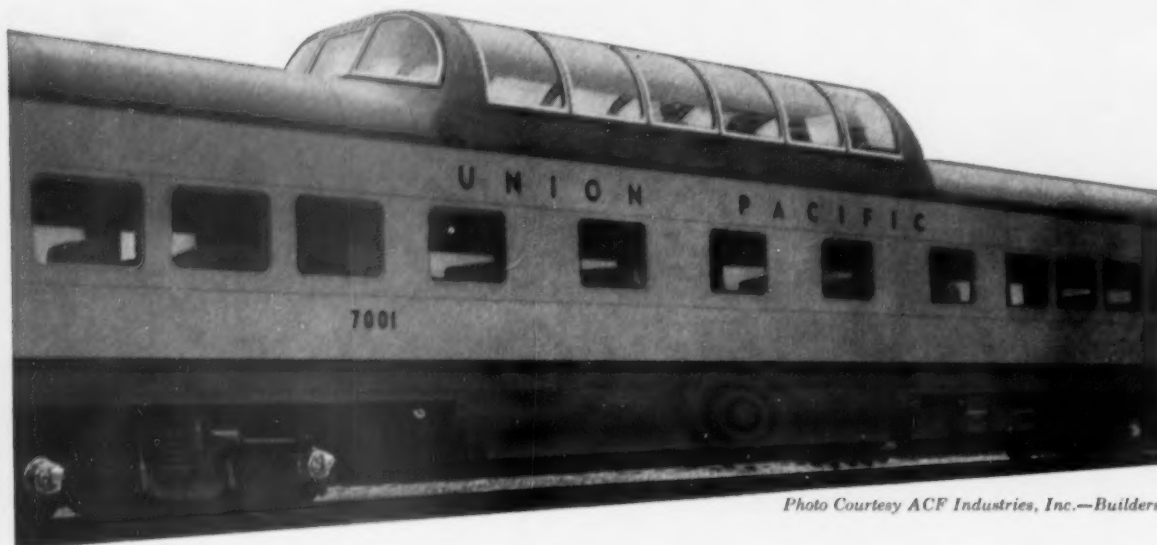


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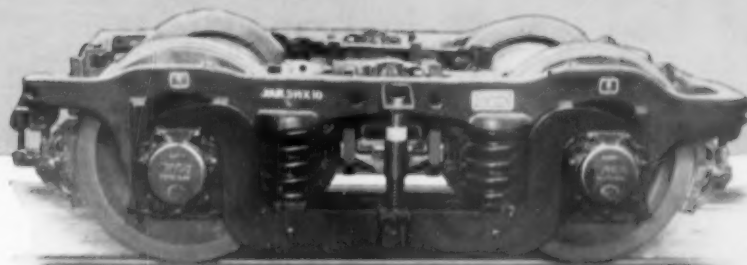
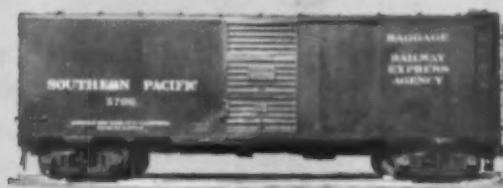
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cars can
operate
anywhere!



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The design of COMMONWEALTH BX Trucks incorporates many features of COMMON-

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For every type of commodity car operating in high speed service, COMMONWEALTH BX Trucks offer outstanding advantages in economy and performance.

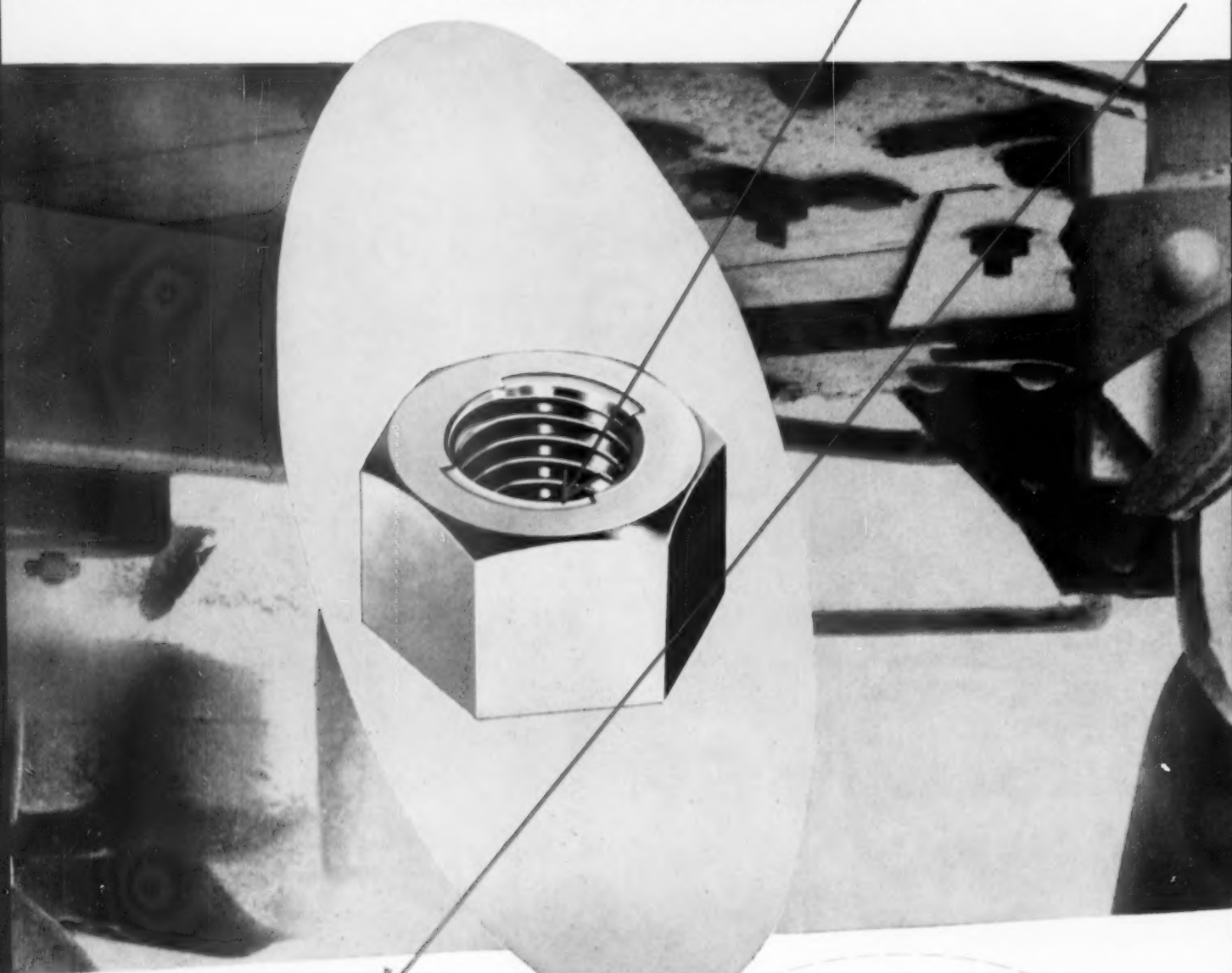


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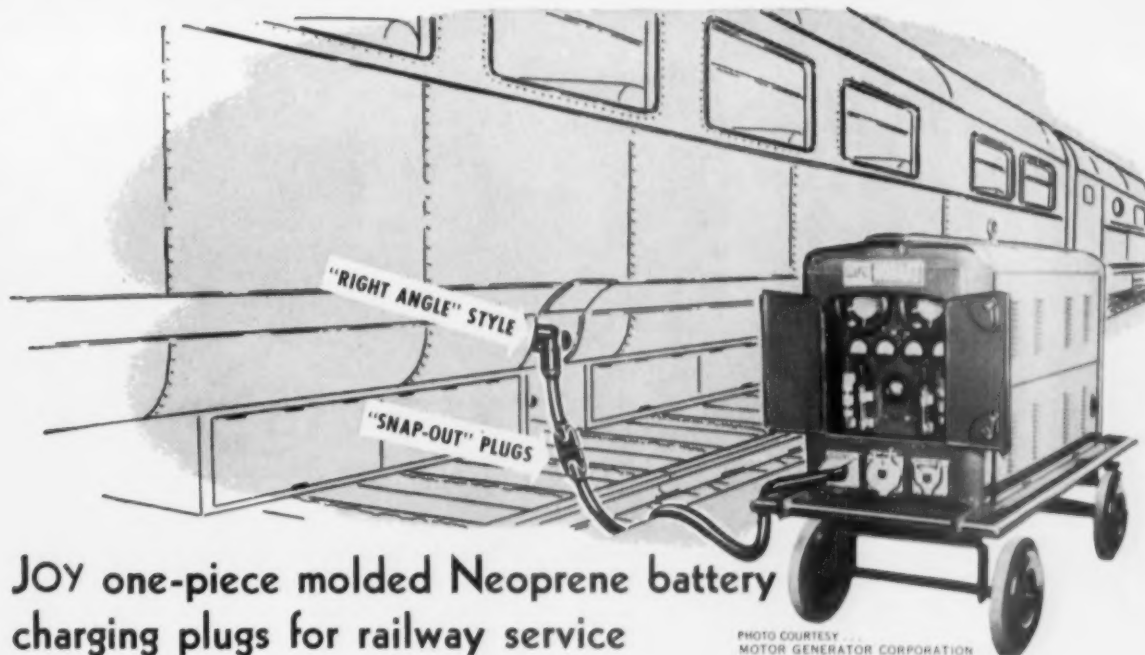
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The lock nut that delivers
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JOY one-piece molded Neoprene battery charging plugs for railway service

Built to the blueprint of railway needs, JOY battery charging plugs are trim, one-piece Neoprene jacketed units with replaceable contacts. They will absorb relatively heavy blows without distorting and are practically immune to damage by oils, grease, acids, alkalies and moisture. Right Angle design (illus. above) furnished on a 21" length of cable with Male "Snap-out" plug on other end. Conventional design available in "molded-to-cable" or "attachable" styles as described below. JOY MANUFACTURING COMPANY, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Co. (Canada) Limited, Galt, Ontario.

Attachable design . . .

Can be quickly attached to or detached from cable without use of special tools. Connecting head has screw type wiring lugs. Neoprene sleeve automatically locks in position over cable/connector wiring junction through action of mating serrated lips inside sleeve and on O.D. of plug. Worm gear activated clamp insures snug fit between sleeve and cable. Contacts are replaceable.



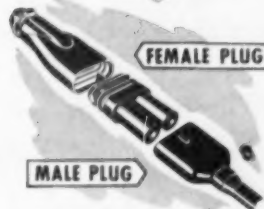
Molded-to-cable design . . .

JOY molded-to-cable style plugs provide extra strength at vital cable/connector junctions. Furnished with 3/6" cable leads for splicing to power cable . . . however, also available factory vulcanized to cable lengths specified by customer, or as jumpers with male "Snap-out" connector on power connection end. Contacts are replaceable.



Mating Car Receptacles . . .

Choice of Swivel or Flush mounted aluminum housings. Both have spring loaded covers and replaceable Neoprene inserts. Furnished with 12" insulated pigtail wiring leads (other lengths available). Carefully manufactured to insure a long life of dependable service.



"Snap-out" Plugs . . .

Protect hard-to-replace battery charging equipment from unexpected train movement by providing a secondary connection approximately 21" below car receptacle that will disengage under a 20 to 25 lb. pull. Male plug (illus. at left) available only in Molded-to-cable design. Mating female plug, attaches to cable from power source, supplied in Molded-to-cable or Attachable designs.

Yours for the asking . . . Free literature on JOY railroad products!

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Available with **SNAP-OUT**
CABLE
SECTIONALIZATION

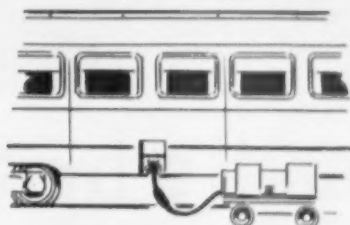


Illustration depicts standby power hook-up from motor generator unit



When train moves before disconnects are made . . . "Snap-out" plugs pull apart

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OF ENGINEERING LEADERSHIP

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Here's a brush that's built to take it!

It's the Speer E-37 paired brush, specifically manufactured for use in the traction motors of industrial-type diesel-electric locomotives.

These rugged engines put in a lifetime of grueling service; every day their brushes take a beating from shock and vibration. But the E-37 paired brush assures effective commutation and long, maintenance-free service under stress because its design includes such exclusive features as:

- a neoprene pad inserted in the top of the brush to absorb shock and reduce vibration
- a strong, vibration-proof shunt connection—made solid with Speer's own patented tamping compound

Whether you are maintaining an industrial motive unit or higher horsepower diesel-electric locomotives, there's a Speer brush made specifically for your equipment. And you'll find that Speer brushes consistently have a competitive edge because of their expert design and careful manufacture.

Speer brushes are designed for even wear, reduced vibration. That's why they give you improved commutation, longer service life... than ordinary brushes.



Write now for the new Speer Brush Catalog

SPEER Carbon Co.
St. Marys, Pa.



Against a background of the majestic Canadian Rockies, The Canadian rounds a horseshoe curve deep in the Bow River Valley.

Palace on Wheels

The Canadian, gleaming new luxury train of the Canadian Pacific system, is now in regular transcontinental operation. On the 24th of April, thrilled passengers stepped aboard for the maiden journey—a run of 2,881 miles between Montreal and Vancouver, and 2,704 miles between Toronto and Vancouver.

This spectacularly beautiful train, a virtual palace on wheels, is Canada's first stainless-steel Scenic Dome streamliner. Diesel-powered, it travels the Montreal-Vancouver route in 71 hours, 10 minutes; from Toronto, the time is 67 hours, 55 minutes. West-east schedules are slightly faster.

Equipment is superb. In addition to the dome cars, which afford an unobstructed view of Canada's scenic grandeur, there are lounges, a coffee shop, a beautifully appointed dining car, the latest in sleeping cars, and de luxe coaches with reclining seats. The cars were built by the craftsmen of the Budd Company's Red Lion Shops in Philadelphia.

Among the basic items that make for a comfortable ride are Bethlehem wheel-and-axle sets. These vital products reflect the highest standards of workmanship, and qualitywise they match all other components of the magnificent cars. It goes without saying that Bethlehem is gratified to be represented so substantially in The Canadian, one of the great trains of our time.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM WROUGHT-STEEL WHEELS

COMPANIONS TO BETHLEHEM FORGED-STEEL AXLES

FREIGHT • PASSENGER • DIESEL



71% of hot boxes stem from waste packing (mostly "waste-grabs")



Cut-away illustration shows the simplified design of U. S. EVER-PAC and the absence of metal parts. Oil is fed to the journal through the wick pad which receives its supply by capillary action from integral wicks, pumping action, and from the oil-saturated synthetic sponge rubber pad.

The new, proven U. S. EVER-PAC* abolishes "waste-grabs"

Here at last is the Journal Lubricator that meets the railroads' chief demand:

Makes "waste-grabs" and other failures of waste packing impossible!

Interchanges with present equipment!

(No shop modifications, machining or additional labor costs)

No costly special oil seals required!

Low-cost initial installation!

Low-cost upkeep!

Easy determination of oil level!

Trouble-free service!

71% of hot boxes are directly attributable to waste packing, mostly "waste-grabs." Ever-Pac makes "waste-grabs" impossible!

U. S. Ever-Pac has A.A.R. approval for application to a specified number of cars which move in general interchange service (Docket No. L-129).

Years of intensive research and testing show conclusively that with U. S. Ever-Pac, a product of United

States Rubber Company, a major cause of hot boxes can now be eliminated.

CONSTANT 3-WAY OIL DELIVERY!

(1) *Capillary action soaks up oil.* The hungry wick is oil-absorbent. The yieldable sponge rubber, a specially developed synthetic compound, provides a cushioned upward contact at all times, providing a controlled rate of clean oil distribution.

(2) *Pumping action.* Each vertical or lateral movement of the journal or journal box compresses the pad, thereby setting up a pumping action which pumps oil from the reservoir under the pad through holes to the distributing wick pad.

(3) *Sponge pad flexing.* Each movement of the journal or journal box flexes the yielding pad and makes the pad "breathe out" *even more oil*—because the pad retains 2 pints of oil above and beyond the amount of oil in the oil reservoir.

We only have space here to give you the highlights of EVER-PAC. Send for free booklet that tells full details. Write to address below.

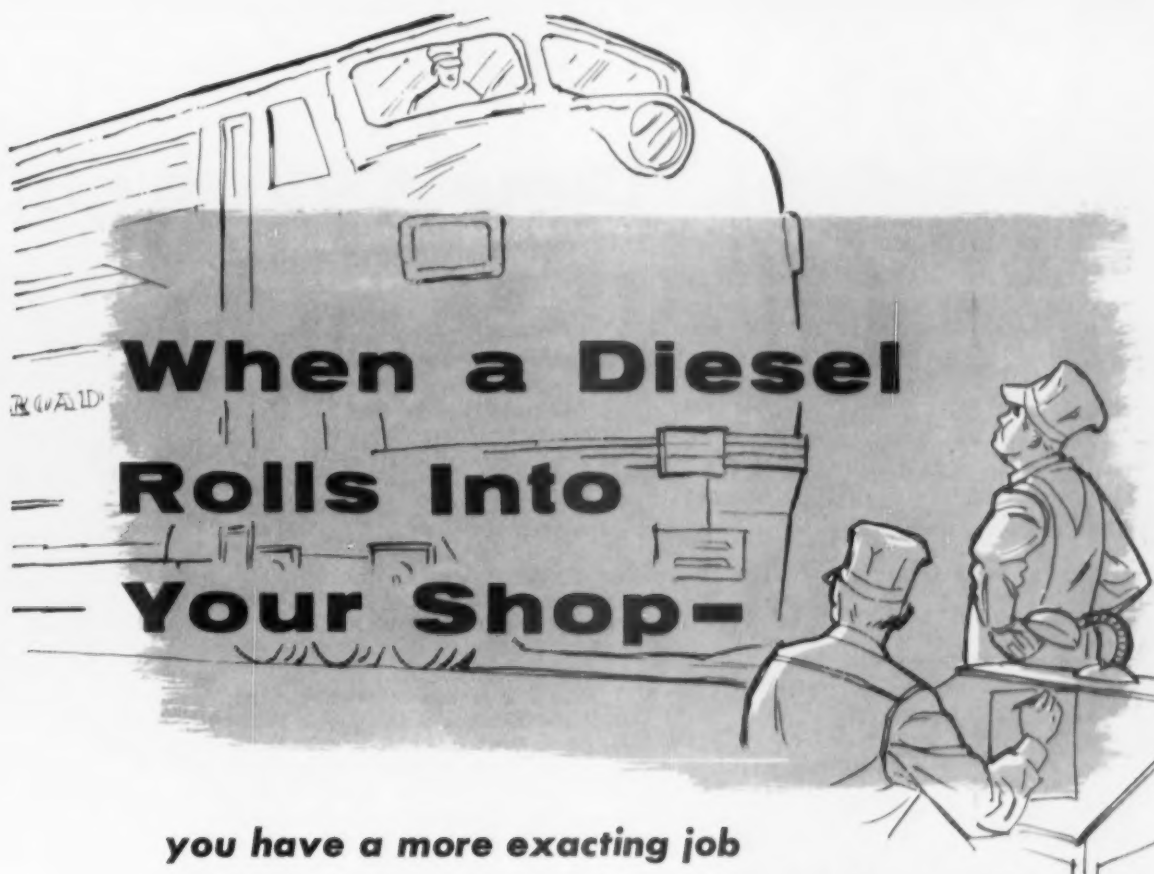
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"U. S." Research perfects it... "U. S." Production builds it... U. S. Industry depends on it!

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When a Diesel Rolls Into Your Shop—

***you have a more exacting job
finding cracked parts than you ever had with steam***

With Diesels you must inspect precision parts—pistons, piston carriers, rocker arms, connecting rods, etc.—for cracks produced by heat as well as by fatigue. The inspection requirements of Diesel precision parts are entirely different from the large steam locomotive parts.

Effective Diesel inspection calls for Magnaglo*. Older methods, including Magnaflux* dry powder units, are not sensitive enough for this more

exacting job. For maximum sensitivity and speed during inspection, Magnaglo, that reveals every crack by a fluorescent line, is recommended by railroad authorities. Nothing else assures positive detection—with the least possible man hours—on equipment especially designed for railroad use.

Magnaglo units are built in a range of sizes to meet specific requirements. For shops where no crankshafts or axles are to be inspected, as in "topping" or turn-around overhaul of pistons, cylinders, rods, injectors, etc., the DRC-543 Magnaflux-Magnaglo unit is needed. For major Diesel shops, the RC-1925 unit is equipped to handle every working part, regardless of size, used in Diesel locomotives.

Write today for bulletins and technical reports that tell how Magnaglo is used by other railroads—to assure the maximum availability that is built into Diesels.

* Magnaflux and Magnaglo are registered trademarks of the Magnaflux Corporation.



Here's maximum sensitivity for the inspection of pistons, rods, pins, gears, injectors, etc. This DRC-543 unit is ideal for "topping" inspections in turn-around shops.

MAGNAFLUX



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Shelby and Sweeney tame a tough nut

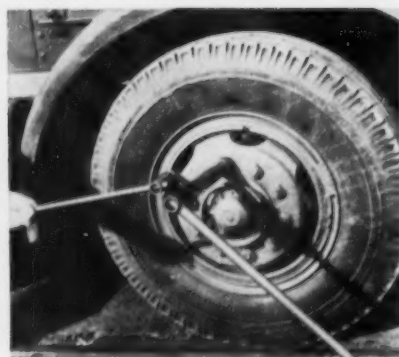
• The Sweeney POWERENCH is a rugged nut turning tool specifically designed with geared action for tightening or loosening the nuts on dual wheels, aircraft propeller shafts, diesel engine cylinder heads, railroad locomotives, and for countless other heavy-duty applications.

Super tough equipment calls for super strong materials. That's why Shelby Seamless Mechanical Tubing—in sizes from 1 1/8 in. O.D. to 5 3/4 in. O.D.—is used in the manufacture of POWERENCH assemblies. The great strength, complete uniformity, and extreme dimensional accuracy of Shelby Seamless make it the ideal mechanical tubing for the fabrication of such heavy-duty materials. Moreover, it is safe and workable—possessing excellent machining and superior welding properties.

Produced to exacting standards by the world's largest manufacturer of tubular steel products, Shelby Seamless Mechanical Tubing is available in a wide range of diameters, wall thicknesses, various shapes and steel analyses. Call on our engineers for recommendations. They will be glad to make a study of your particular requirements and help you apply Shelby Seamless to your specifications.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

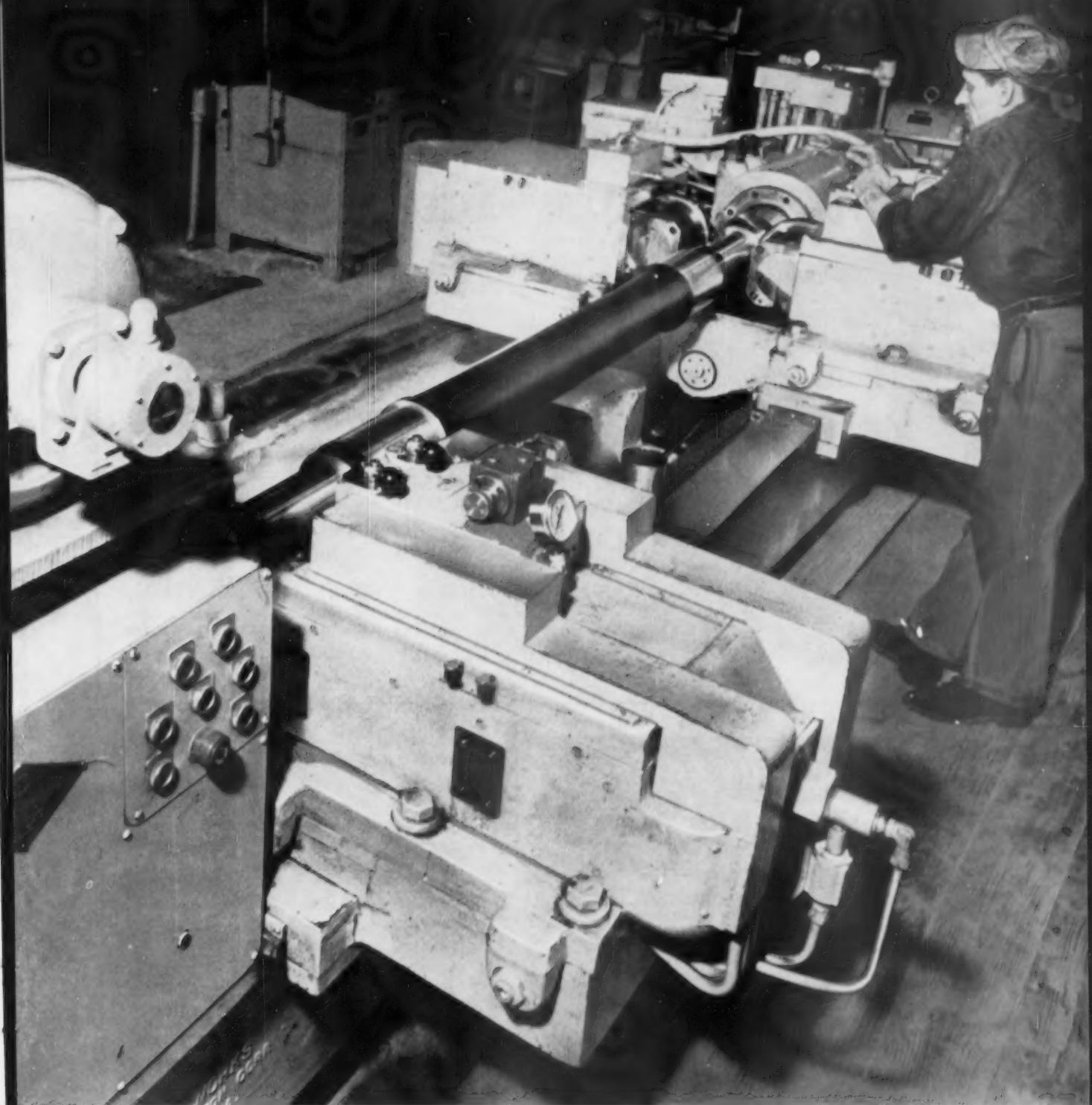


USS SHELBY SEAMLESS MECHANICAL TUBING



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UNITED STATES STEEL



B & O cuts burnishing time 25% with Niles hydraulic lathe

Burnishing time has been cut 25% with this Niles hydraulic burnishing lathe in the Glenwood (Pittsburgh) Shops of the Baltimore & Ohio Railroad. Used for burnishing car wheel axle journals, this heavy-duty machine has eliminated all manual labor. Easily operated hydraulic devices assure close

control during burnishing . . . assure uniform finish.

For further details on how you can cut down-time by modernizing your wheel and axle shop with high-speed Niles tools, please write today to Hamilton Division, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio.



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Standard holders with inserted carbide-tipped tool bits reduce your costs and give improved working conditions. All tool bits are furnished finished ground with chip breakers and are ready for immediate use. Tool bits are adjustable in two directions to compensate for wear.

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*The coolant
stinks, eh?*

Well, don't dump it!

We'll kill that odor with the new
powder-additive: **Rance-RID**

IT'S A SERIOUS COST-PROBLEM:

Metalworking plants are pouring coolant and labor dollars down the drain. The reason: coolant turns rancid.

RANCE-RID SOLVES THE PROBLEM:

It restores the original condition of the oil emulsion. It smells, looks, and is like new. No masking odors are used . . . Use it in central-type coolant systems, or in individual machines. Treat the same coolant over and over again!

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That sounds generous. Actually, it isn't. Rance-Rid sales have been built on one-ounce samples. Just one ounce treats 20 gallons of soluble oil emulsion . . . Try it—at no cost. Your inquiry brings the sample.

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Your Inquiry
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SAMPLE**

Hurry . . . while
our head is
still in the sand!



"NEW ONES FOR OLD"

Sweeney POWERENCH EXCHANGE

We have developed a new POWERENCH for use on the cylinder head crab nuts of E.M.D. 567 series engines. This "New Ones for Old" Exchange is offered for a limited time only to enable users of old style POWERENCHES to take advantage of the new style POWERENCH of a considerable savings. Here's the deal:

In exchange for your old style #224 or #225 series POWERENCH (regardless of its condition) we will give you a new, Model 104 POWERENCH at 60% of the regular price of the new POWERENCH.



Old style POWERENCH



New style Model 104 POWERENCH

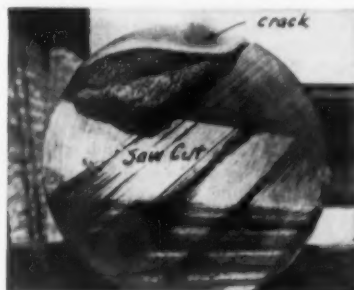
Lighter, the new Model 104 POWERENCH weighs only 28 lbs., compared to the 40 lbs. of old POWERENCHES. Stronger, the new units are strength tested to 10,000 ft. lbs. output, compared to the 5,400 ft. lbs. of the old units. More efficient, the new unit has a 12:1 power ratio, compared to the 7.2:1 ratio of the old units. The new unit will efficiently handle E.M.D. 567C engines, as well as 567, 567A and 567B. Write for particulars!

H. K. SWEENEY MFG. CO. • DENVER 17, COLO.



"Safety is a responsibility to the public as well as sound management practice," states Mr. W. F. Kascal, Chief Mechanical Officer, New York Central System. "To keep pace in today's highly competitive transportation industry no railroad can afford to operate without modern inspection tools."

The New York Central, through co-operative research with Sperry, was instrumental in developing practical ultrasonic diesel axle inspection.



Crack in dust guard fillet area, revealed in place by Reflectoscope, could have caused a wreck had it progressed to failure. The Central has three Sperry Ultrasonic Reflectoscopes at work in their Syracuse, Collinwood and Beech Grove Shops. There, rapid, thorough, in-place testing of all critical areas of diesel axles is performed regularly on an integrated maintenance schedule.



Insures against costly diesel axle failure with REGULAR ULTRASONIC INSPECTION



Under-the-engine testing gives fast, positive and economical insurance against sudden axle fatigue failure. Testing from the axle end, three angle-beam search units are used to probe the three critical areas. The 24° search unit scans the dust guard area; the 19° search unit tests the wheel seat area; and the 15.5° search unit inspects the gear seat area. Each unit is moved around the outer periphery of the axle end. This accurately beams the sound to the area under test. As ample proof of the value of ultrasonic inspection, the Central found five defective diesel axles among the first 1737 tested.



Reflectoscope inspection assures sound diesel axles for the 20th Century Limited, shown here speeding down the Hudson toward New York City. The Reflectoscope is also invaluable for testing freight car axles and wheels as well as diesel axles and engine parts.



SPERRY RAIL SERVICE

Division of Sperry Products, Inc.
Danbury, Conn.

New York Chicago St. Louis

Continuous research in ultrasonic testing has developed techniques for inspecting numerous vital railroad components. For example, Sperry has the answer to fast, economic car axle and wheel testing problems. Contact the Sperry office nearest you for detailed information on these and other tests. We'll be glad to give you working demonstrations in your shops.

Manufacturers' Literature

Following is a compilation of free literature, pamphlets, and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information; requests will be handled direct by manufacturers.

1. DIESEL ENGINES. *Ingersoll-Rand.* 20-page colorful bulletin (10,040) describes the features of the Type S and SS heavy duty diesel engines in sizes from 375 to 1000 hp.; gives complete data on lubrication, cooling and fuel injection systems.

2. NICKEL-COPPER STEELS. *International Nickel Co.* 48-page booklet (3004) "Nickel-Copper High Strength Low Alloy Steels" illustrates the wide application of these steels; gives working methods, mechanical properties, compositions and availability of seven steels of this class.

3. D-C MOTOR. *Reliance Electric & Engineering Co.* 12-page illustrated bulletin (C-2002) "The New Reliance Super T Line D-c. Motor with Dynamic Response" includes data on speed ranges, acceleration rates, enclosures, dimensions and selection.

4. POWER QUILL. *Precise Products Corp.* 20-page General Catalog FGH-2 and 4-page price list describe, illustrate and give specifications on the all new Precise Super 60 Power Quill and Grinder-Millers.

5. ELECTRICAL TAPES. *Permacel Tape Corp.* 4-page brochure "Permacel 2 in 1 Electrical Tapes" discusses the application of one tape doing the work of two; discusses how these tapes are both heat curing and self-sticking, how they stick at a touch, and that baking or high operating temperatures strengthen rather than soften the adhesive.

6. BEARING EXTRACTOR. *Engineering Imports.* 4-page brochure "Tracta . . . A New Type Ball and Roller Bearing Extractor" diagrams and explains this extractor which "is gripped on the inner race" reducing bearing or shaft damage.

7. LUBRICANTS. *The Alpha Corp.* Field Report #140 gives a "how-to" discussion on the lubrication of engines and compressors with "Molykote Type G" molybdenum disulfide.

8. PROTECTIVE COATING. *Pennsylvania Salt Mfg. Co.* Complete product information offered on Thick-Coat (new resin coating), including specifications, estimating data and directions.

9. JIB CRANES. *Abell-Howe Co.* 8-page brochure "Jib Crane For Economical Free-Swinging" pictures eight of the more popular types of jib cranes and describes the usual application of each; includes available accessory equipment.

10. ALUMINUM-SHEATHED CABLE. *Okonite Co.* 12-page 2-color bulletin (1088) "Okotherm Aluminum-Sheathed Cable" describes, illustrates with on-the-job photos, and with tables gives dimensions and fittings of this new cable construction for hot (up to 200° C. or 392° F.) locations.

11. ELECTRIC PLANTS. *Multi-Matic Corp.* 4-page catalog (G-3155) illustrates complete line of 23 Gen-A-Matic electric plants (both AC and DC), illustrates some of the line, shows typical uses, gives in chart form specifications and a table of power requirements.

12. CRANE SCALES. *Baldwin-Lima-Hamilton Corp.* 12-page illustrated bulletin (4304) describes, illustrates and gives typical uses of Baldwin SR-4 crane scales; includes seven standard sizes, special larger size scales, instrumentation, accessories and applications.

13. LATHES. *South Bend Lathe Works.* 128-page 53rd edition of "How to Run a Lathe," with over 365 illustrations, in eleven chapters, covers items such as correct installation and leveling of lathes, standard tolerances, and tooling dimensions; in non-technical language, available in paper binding for 50¢ per copy.

14. GEARING. *Foote Bros. Gear & Machine Corp.* 42-page plastic-bound Engineering Manual (DR-2) on the complete line of Foote Bros. Duty-Rated Lifetime Gearing; illustrates and gives specifications, and special section gives gear maintenance tips.

15. PRESS BRAKES & BRAKE DIES. *Service Machine Co., Inc.* 8-page 2-color folder illustrates and gives specifications on SEMCO steel press brakes and forged steel press brake dies.

16. STUD WELDING. *K S M Products, Inc.* 16-page booklet "Standardized Stud Welding Design and Specification" describes, illustrates and gives ordering, application and engineering data on 12 most commonly used studs, and on pins and pads.

17. ENGINES. *Le Roi Div. Westinghouse Air Brake Co.* 8-page 3-color catalog-bulletin (E-9) describes and illustrates the 115 to 410 horsepower Le Roi L3000, H2000, and F1500 engines, uses cutaway views and photos to show features; basic specifications and map showing location of factory branches and distributors included.

EQUIPMENT

(Continued from page 26)

possible the higher speeds and helps to stabilize operation of the electrode. The contact technique can be used. Spatter is low, and slag removal is much easier than conventional operation with other electrodes.

The product is usable on alloy and mild steels, and meets the requirements of the E-6016 classification in "as-welded" condition, and E-7016 class in the "stress relieved" condition. *Welding Department, General Electric Company, 1 River Road, Schenectady 5, N. Y.*

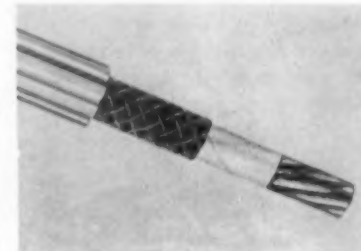


Dielectric Tester

The Model 424 D.C. Hypot is a versatile instrument for dielectric testing up to 5000 volts dc, and insulation measurement up to 50,000 megohms. This unit has been redesigned for increased serviceability and ease of panel mounting.

The device features a continuously variable output of 0-5/10/50/100 microamperes indicated on a microammeter which is electronically protected against overload. Alternating current ripple at rated voltage and current is less than 1 per cent.

It is housed in a grey wrinkle finish steel case which is 22 in. by 14-3/4 in. by 12-3/16 in. with 5 ft output leads terminating in a clip and retractable tip prod. The unit is arranged for standard rack and panel mounting. *Associated Research, Inc., 3758 West Belmont Avenue, Chicago 18, Ill.*



Fluted Welding Cable

Called U.S. Royal Gold Welding Cable, the product is light and flexible. Its manufacturer claims that it is long wearing

Reader Service Department
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

MAY, 1955

Please send literature circled below:

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	

Also, please send me additional product information as follows: (company, product & page number)

Name

Title or Position

Company

Address

City

Zone

State

on all types of welding equipment and has greater impact resistance than special cable constructions. The fluted jacket gives better grip and is cooler to handle, since its greater surface area dissipates heat faster than conventional round cable.

Finished with a yellow jacket, it is easier to see, reducing accidental damage. This also provides identification from a black cable in cases where two cables are required on welding units.

This jacket is made of 60 per cent natural rubber compound with high impact, abrasion and moisture resistance. A reinforcing braid of rayon provides a non-slip bond between the jacket and the insulation. The conductors are wrapped with a high grade insulating paper tape. *United States Rubber Company, Rockefeller Center, New York 20, N. Y.*



Pressure Gage

A time-saving method of production checking the hydraulic tailstock pressure of lathes with this pressure gage has been reported by a manufacturer of automatic lathes. All that is necessary is to place the gauge between the blocks which, in turn, are held between the gauge and tailstock of the Camlock spindle nose. Full tailstock pressure is then exerted against the gage by turning a tiny crank on the side of the tailstock, and a reading in pounds is instantly given on the gage dial.

The instruments are available in ranges for 0 to 10 lb up to as high as 0 to 10,000 lb in 10 sizes. All capacities have an accuracy of 1 per cent plus or minus and will withstand accidental overloads up to 25 per cent. The 10,000-lb model measures only 4-9/16 by 5-7/8 by 2-9/16 in and the lighter models are still smaller. *W. C. Dillon & Co., 14620 Keswick street, Van Nuys, Cal.*

Aluminum-Coated Steel

Armco Aluminized Steel Type 2 is said to combine the corrosion-resisting and heat-reflecting qualities of aluminum with the strength of steel. Several thousand tons of the product have been used in development work in prefabricated industrial, commercial and farm buildings, industrial rolling doors, water storage tanks, roof decks, and other applications under general atmospheric conditions.

The steel is reported to have the same

They're Kind to Commutators!

In many cases—especially under difficult service conditions—Stackpole diesel-electric brushes have actually improved poor commutator conditions that developed when other makes of brushes were used . . . with adequate brush life in the bargain!

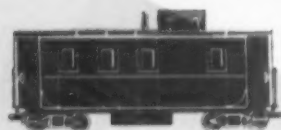
STACKPOLE CARBON COMPANY, St. Marys, Pa.

STACKPOLE

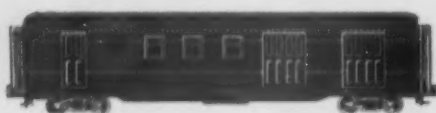
Diesel Brushes

The only $\frac{1}{2}$ to 5 KW
Positive Gear Railway
Generator Drive
 on the market

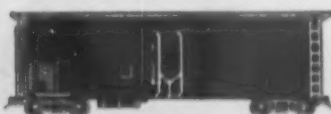
... now makes
 possible New efficiencies,
 New economies, New conveniences
 for ALL railroads



TWO-WAY RADIO



LIGHTING
EQUIPMENT



REFRIGERATION

The new, small $\frac{1}{2}$ to 5 KW Spicer **Positive Gear** Generator Drive makes available to caboose, baggage, refrigerator, and mail cars, all the advantages of steady, ample electrical current.

And the new Spicer Drive delivers the power for this $\frac{1}{2}$ to 5 KW current with all the standards of efficiency and dependability established by the large, time-proved Spicer **Positive Gear** Generator Drive. More than 11,000 large Spicer Drives are now in use on over 70 railroads all over the world.

The Spicer Railway Generator Drive for radio, lighting, refrigeration and other electrical equipment consists of a very simple application of quiet, long-lived spiral bevel gear and pinion mounted at the end of a standard axle, thereby permitting rapid inspection and maintenance. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Safety Clutch which is attached to the generator. This safety clutch absorbs heavy shock loads and disconnects the drive line in case of an excessive overload, thus protecting the generator from damage.

Spicer Positive Railway Generator Drives can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.

Manufactured and Sold by:

Spicer

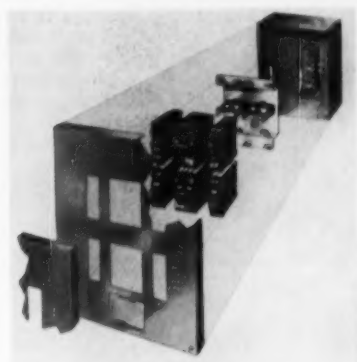
DANA
CORPORATION

TOLEDO 1, OHIO

high reflectivity of radiant heat as aluminum whether from the sun or from low temperature heat sources as are used to heat buildings in winter. Resistance to fire damage is said to be much better than that of aluminum or galvanized steel. The coating withstands temperatures up to 900 deg F with no change whatever, and temperatures up to 1250 deg F without serious damage to the coating.

Coefficient of expansion is said to be only half that of aluminum. This means less trouble from buckling or tearing at nail, rivet or bolt holes when sections or panels undergo heating and cooling cycles. It can be embossed and spun, but it is not recommended for drawing operations. Welding is easily done by all conventional methods and a satisfactory method of soldering is still under development.

Cost per sq ft is claimed to be generally lower than aluminum of equal thickness. Cost savings are pronounced because the greater strength of the steel base permits use of lighter gauges. The product does not require painting to extend service life. *Armco Steel Corporation, Middletown, Ohio.*



Circuit Breaker Load Centers

These load centers are for use as service entrance equipment. A snap-action spring clip that allows load center interiors to be installed and removed without screws, tools or any adjustments is an important feature of the device.

Available in 8, 12, 16 or 20 circuits, they are equipped with 100 amp main lugs. The 16-circuit load center is a split-bus design in which one two-pole circuit breaker feeds up to eight other breakers on the sub-distribution portion of the bus. Fronts with doors are available for the 12, 16 and 20 circuit load centers.

All current-carrying parts are silver-plated copper which gives high conductivity and cool operation for greater safety. Boxes are finished with a Bonderite coating which seals the paint to the metal and protects against rust. Both general purpose and raintight enclosures are available for the load centers and fronts for either surface or flush mounting can be specified. *General Electric Company, Trumbull Components Department, Section TC-1, Plainville, Conn.*

GARLOCK REPLACEMENT PARTS

Gaskets—Packings—Molded Rubber Rings for diesel locomotives . . .



Section of Garlock's diesel parts stock room

NOW pre-stocked in handy packages,
ready for immediate shipment



Packaging and labeling
diesel parts after
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GARLOCK diesel replacement parts—gaskets, packings and molded rubber rings—are packaged in convenient quantities for ease in handling, storing and redistribution to shop men, overhaul shops and terminal points.

All packages are labeled for instant identification—no cross-reference parts list needed.

Garlock diesel gaskets, packings and molded rubber rings are giving completely satisfactory service on leading railroads. Specify Garlock diesel replacement parts and write us for complete parts-and-price list.

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PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS



A/C Cylinders too!



Another road tested application
for wear resistant PORUS-KROME*

● Write today for detailed information on this **NEW**
reclamation service.

Address -

Dept. RL-1, VAN DER HORST CORP., OLEAN, N. Y.

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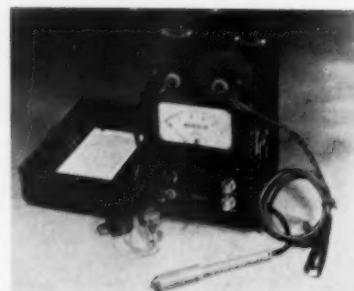
Good for the Life of your Engines



TERRELL, TEXAS
OLEAN, NEW YORK
LOS ANGELES, CALIFORNIA**
HILVERSUM, HOLLAND

*U. S. Patents
2,048,578, 2,314,604, 2,412,698

** SparTan Engineering
West Coast Licensee



Insulation Test Set

The Model 405A Hypot Junior insulation test set, with a rating of 0-5000 volt a-c, is said to complete the line of these sets with ratings from 1,500 to 10,000 volt. The unit was primarily designed for accurate, non-destructive testing of appliances and small electrical components by unskilled operators, and meets Underwriters Specifications for most of this equipment.

The tester features continuously variable output voltage, current limiting high reactance transformer, a neon breakdown lamp to indicate arcing or corona in test circuit, a neon leakage lamp to indicate excessive current flow, grounds and short circuits, and a kilovoltmeter connected directly across the output. Input to the device is 115 volt a-c, 60 cycle.

The instrument is housed in a welded steel case measuring 6 in. by 9 in. by 8-1/2 in. with a plastic carrying handle. Net weight is 15 lb. *Associated Research, Inc., 3578 West Belmont ave., Chicago 18.*



Frequency Meter

For checking alternating current in the 400 cycle per second range, this meter operates on the principle of a series of progressively tuned reeds, with a-c frequency indicated by vibration of the corresponding reed or reeds falling within a sharply peaked resonance response curve.

Insulated test probes are provided for shunting a portion of voltage in the test line across the 10,000 ohm internal resistance of the meter. An electromagnetic coil-armature combination supplies mechanical energy at the a-c frequency



***A straight run
to savings...***

THE **NATIONAL** BRUSH LINE

TRADE-MARK

FOR TRACTION MOTORS, GENERATORS AND AUXILIARIES

When you specify brushes, do you take into account
all the cost-factors affected by brush performance?

HERE'S HOW TO FIGURE REAL BRUSH COST:

Service Life: brush replacement cost is far more than the cost of the brushes. The down-time involved in more frequent brush installation quickly eats up any first-cost "economy".

Strength: brush breakage and shunt failure mean costly interruptions of service — wear or damage to major equipment.

Commutating ability: frequency of commutator maintenance and overhaul is a direct measurement of brush economy. Arcing, chatter, bar-burning, copper-drag-

ging and threading are often signs of faulty brush performance.

The cheapest brush is the brush that costs least to use. That's one reason why far more "National" brushes are used in diesel-electric locomotive service than all other makes combined.



FREE! National Carbon's BRUSH DIGEST — two-year course in motor and generator maintenance... specially edited for operating personnel. Order in bulk for all your men!

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

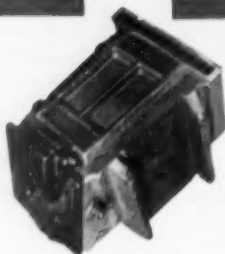
A Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y.

SALES OFFICES: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco

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You are assured complete quality control, from raw material to finished journal box, when you choose Franklin Balmar. Both surface-bearing and roller bearing boxes are made of electric furnace steel, cast in our own foundry—and machined to close tolerances on modern equipment by our own highly trained personnel. When you need journal boxes or other steel castings send us your inquiries.



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**ANNOUNCING . . . The most
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in ARC WELDING equipment
in years!**

BREN WELD
MODEL 200 AW

**Weights only 65 lbs.—
Carry it to the job!**

Patent Pending

OBSOLETE ALL OTHER WELDERS OF COMPARABLE RATING

List Price
\$169.50

F. O. B.
Long Island
City, N. Y.

KASSON

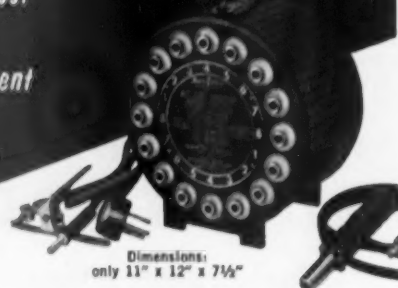
Manufactured by
**BRENNEN, BUCCI
& WEBER, INC.**
New York City

Sensational new transformer development produces far more power to pound! The BREN/WELD does work of conventional welders 4 or 5 times its size and weight . . . Actually delivers up to 250 amps at reduced duty cycle.

Simple to use, fully guaranteed, it operates on 110/220 volts AC, 50/60 cycles; handles electrodes from 3/64" to 5/32". Has adjustable arc voltage for different arc characteristics. Ideal for plant production and maintenance, for construction work, railroads, on the farm or home.

See your dealer or write direct for details of free trial offer!

24 hour delivery from stock!



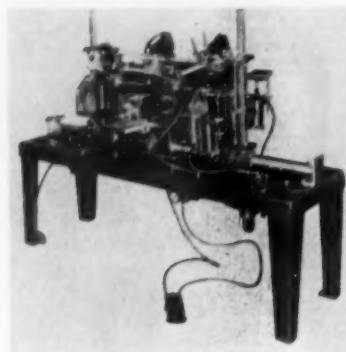
Dimensions:
only 11" x 12" x 7 1/4"

**FIRST TRULY PORTABLE
200 AMP. OUTPUT
ARC WELDER**

SALES DIVISION
KASSON DIE & MOTOR CORPORATION
Integrity Since 1919
32-14 NORTHERN BOULEVARD, LONG ISLAND CITY 1, N. Y.

rate to the entire row of reeds. Only the reed having a natural frequency corresponding to the line frequency will undergo vibrational response. These reeds are gold-plated to prevent corrosion.

Instruments and probes are set in a heavy-gage deep-drawn, aluminum case, 6-1/8 by 3-1/4 by 3-1/4 in., equipped with a carrying ring, snap lock, and a slip hinged, removable cover. Winslow Company, 9 Liberty street, Newark, N. J.



Pneumatic Coil Spreader

This device has been designed for smooth, easy and precise coil forming in approximately 1/3 to 1/2 the time of hand spreading methods. The operator need only insert the loop, step on the foot pedal and remove the finished coil.

Pneumatic operation forms the heaviest, most complex coils to correct spread and exact pitch. They are said to reduce installation time in stators and armatures. Set-up time is short as three adjustments for width of spread and angle take the place of nearly a dozen on old-fashioned spreaders.

The unit is precision built, has few moving parts. Its table top and legs are of 1/4 in. steel plate. Manufactured in five standard models of 48 in., 60 in., 90 in., 120 in., and 240 in. capacities by James Manufacturing Company, Inc., Cincinnati, Ohio and distributed by Electric Service Manufacturing Company, Peerless Tool Division, Hanover, Pa.

Cleaners and Solvents

A recently developed line of degreasing solvents and cleaners has been designated by the manufacturer as Darsol. Developed to replace carbon tetrachloride and other toxic compounds are Darsol solvents 650, 600 and 350. Claimed to be of low toxicity, these solvents are specified for metal cleaning where rapid drying and absence of film is required.

Darsol solvents 74-C, 45-A and 62-B are used to remove grease, oil and traffic dirt on metal parts and equipment. These cleaners are of the emulsifying type and are diluted with kerosene or water in preparing the cleaning solution. The Dacar Chemical Products Co., McCartney at Wabash Street, West End, Pittsburgh 20, Pa.

After TWO years of field-testing, here's the

NEW IMPROVED

TIREX CORD

- *It's more flexible than ever before!*
- *It has greater pliability when cold!*
- *It's much easier and faster to machine-strip!*

New TIREX CORD retains its Selenium Neoprene Armor for added toughness.

New TIREX CORD is still cured in lead to make it smoother, denser and more uniform.

Simplex

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The New TIREX is the most supple, limber TIREX Cord ever made!

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SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

Lewis seal-tite car bolts

More than 85% of America's Class I railroads use Lewis Seal-tite products. Designed to do a better job . . . to last longer . . . to meet the most exacting specifications. Specify Hot Dip Galvanized, Zinc finish for Double-Life and economy. All products are manufactured in the U.S.A. to A.S.T.M. specifications.

Lewis BOLT & NUT COMPANY
504 Malcolm Ave. S. E.
MINNEAPOLIS 14, MINNESOTA



Seal-tite bolts are available with Lok-tite Nut #2 (shown), or std. sq. and hex. nut.

P.F.E. Safety Records

(Continued from page 11)

operated throughout the entire year without reportable injury. For instance, all departments at the Colton, Cal., shops were accident free last year which was indeed a "jack pot."

At Los Angeles shops, the stores and ice departments had a clear record for

1954. The same can be said for the car and ice departments at Pocatello, Idaho. In some instances, individual departments have had a clear record for several years. Outstanding in this respect is the stores department at Colton which is now starting its fifth year without reportable accident.

The primary purpose of this safety work by the Pacific Fruit Express has been not

only to reduce accidents but build up employee morale and make the various shops and other facilities a place in which men will be proud to work. Looking to the future, special efforts are planned to "hold the line" on reportable accidents and also curtail or eliminate the minor lost-time injuries (3 days or less) which fail to get into official records.

PERSONAL MENTION

Canadian National

ROBERT W. BOWMAN, assistant foreman, Stratford, Ont., motive-power shops, appointed inspector, shop methods, motive power and car equipment department, at Montreal.

W. C. BOWRA, general superintendent of motive power and car equipment, Central region, appointed special assistant in opera-

tion department, Central region, with headquarters at Toronto.

K. W. THOMSON, mechanical engineer, at Montreal, appointed general foreman of the Stratford, Ont., motive-power shops.

Canadian Pacific

C. H. PERCIVAL appointed assistant car foreman at Smith Falls, Ont.

Central of Georgia

HUBERT HAWTHORN, mechanical engineer at Savannah, Ga., has retired. Born: New Castle-on-Tyne, England, April 14, 1885. Career: Began in 1904 as a machinist apprentice on Atlantic Coast Line, later becoming machinist and draftsman before entering service of CoG as a mechanical draftsman in October 1909. In June 1924 appointed shop engineer, and in July 1944, mechanical engineer.

Chesapeake & Ohio

M. P. WINSTON, assistant superintendent locomotive department at Grand Rapids, Mich., appointed assistant to assistant superintendent motive power-diesels at Huntington, W. Va. Former position abolished.

Erie

WALTER G. COLEMAN, road foreman of engines, Kent division, appointed road foreman of engines, Mahoning division.

New York Central System

T. G. BOURNE appointed assistant industrial engineer at New York.

E. A. ANESI appointed electrical supervisor at New York.

Norfolk Southern

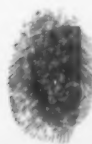
J. H. WILSON, chief mechanical officer at Norfolk, Va., has retired.

M. B. DOWDY, assistant chief mechanical officer, appointed superintendent motive power and equipment, Carolina shops, Norfolk, Va. Former position abolished.

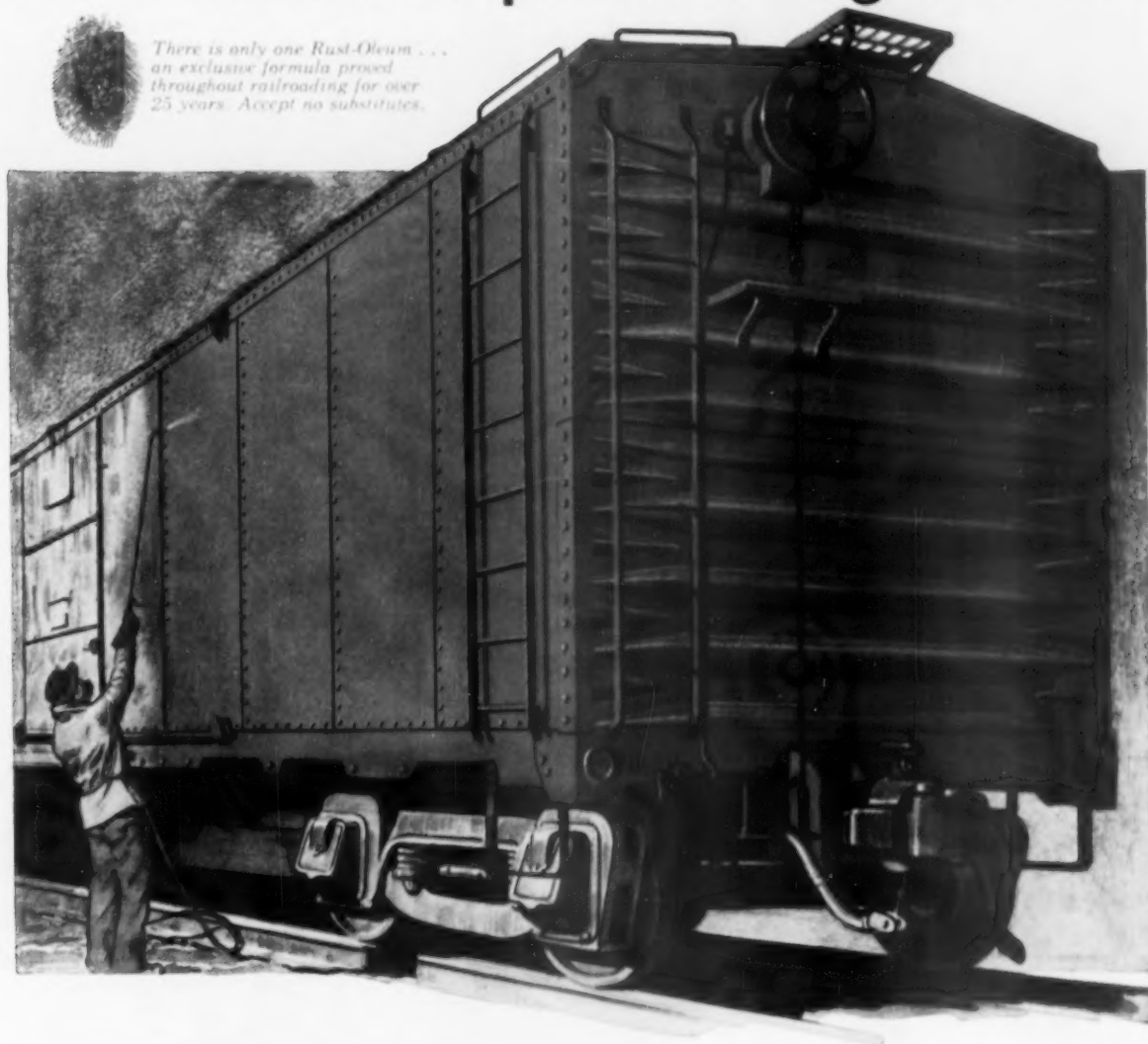
SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
January, 1951	2,840,847	2,870	8,436	11,306	251,269
January, 1952	2,824,298	3,208	7,197	10,405	271,437
1953					
January	2,828,906	2,219	4,123	6,342	446,659
February	2,625,563	2,111	4,059	6,170	425,537
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,140	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256

RUST-OLEUM keeps 'em looking like this!



There is only one Rust-Oleum... an exclusive formula proved throughout railroading for over 25 years. Accept no substitutes.



RUST-OLEUM

STOPS RUST!



Protect new metal surfaces... save even badly rusted metal!—and cut maintenance costs, too. Simply scrape and wirebrush to remove rust scale and loose particles... then brush Rust-Oleum 769 Damp-Proof Red Primer directly over the sound rusted surface. Sandblasting, chemical pre-cleaning and other costly preparations are not usually required. You save time, money, and metal on bridges, rolling stock, signal equipment, tanks, buildings, towers, etc. See how Rust-Oleum can save you money... why major railroads all over the country rely upon Rust-Oleum. Get the complete story from a Rust-Oleum Railroad Rust Preventive Specialist!

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Southern

Atlanta, Ga.

ELBERT L. MACDONALD appointed assistant foreman roundhouse.

JAMES C. DURHAM appointed general foreman car repairs (night).

Hayne Shop, Spartanburg, S. C.

JAMES F. HOLBROOK appointed assistant foreman car shop.

JAMES C. POPE appointed foreman car repairs.

Obituary

THOMAS W. DEMAREST, 87, who retired in 1938 as general superintendent motive power of the Pennsylvania at Philadelphia, died March 7.

SUPPLY TRADE NOTES

BALDWIN-LIMA-HAMILTON CORPORATION, STANDARD STEEL WORKS DIVISION.—C. J. McGowan has been appointed sales engineer in western Pennsylvania and West Virginia, with office in Pittsburgh. Mr. McGowan was formerly associated with Kropp Forge Company at Chicago.

MORTON MANUFACTURING COMPANY.—Robert K. McKenzie, chief engineer of Morton's Libertyville plant, has been appointed sales engineer. He will serve as direct assistant to Robert S. Morton, vice-president, now in charge of the railroad division.

TRANSPORTATION PRODUCTS COMPANY.—James A. King, formerly vice-president in charge of railway sales, Morton Manufacturing Company, has joined the Transportation Products Company as a sales representative at Chicago.

LUNKENHEIMER COMPANY.—Melvin W. Pauly, general sales manager, has been elected vice-president in charge of sales, and Earl F. Ripelle has been elected vice-president in charge of engineering and research.



J. B. Sewell

GARLOCK PACKING COMPANY.—J. B. Sewell, general sales manager, has been elected a vice-president, in which position he will continue to direct sales operation.

Mr. Sewell started with the Garlock Packing Company of Canada, in 1935 as a sales representative in the Montreal area. In 1947 he was elected vice-president of that company. On October 1, 1954, he was transferred to the United States and appointed general sales manager, covering both Canada and the United States.

CUMMINS ENGINE COMPANY.—Paul J. Every has been appointed assistant general sales manager at Columbus, Ind.

R. M. HOLLINGSHEAD CORPORATION.—The Brandon Equipment Company, 332 South Michigan avenue, Chicago, has been appointed distributor of Hollingshead products to the railroad industry.

U. S. INDUSTRIES, INC.—The New York and Chicago executive offices of U. S. Industries are now located at 250 Park avenue, New York 17.

INDUSTRIAL BROWNHOIST CORPORATION.—Marshall A. Norby, sales representative, has been appointed district sales manager at Chicago, succeeding A. P. Lyvers. Richard E. McCoach, sales

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Magnus 51-B is a fine powdered soap and contains over 50% more real soap than do paste-type soaps usually marketed for similar purposes. It dissolves quickly and completely even in cold water. Recommended for air leak detection both on the test bench in the shop and on equipment in the yard.

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Representatives in All Principal Cities

representative at Philadelphia, succeeds J. A. Peppard as district sales manager at Cleveland. Messrs. Lyvers and Peppard are now consultants on special assignments.



A. C. Fecht

LEWIS BOLT & NUT CO.—Anthony C. Fecht has been appointed vice president in charge of sales.

Mr. Fecht began with Lewis Bolt & Nut 27 years ago as a shop weigher and became assistant to the superintendent in 1944. He entered railway sales in 1945 and became general manager of sales for industrial fasteners, job hot-dip galvanizing and other allied departments of the company in 1952.



G. W. Gobrecht

MINK-DAYTON, INC.—George W. Gobrecht, has been appointed assistant to president and general sales manager of Mink-Dayton, Inc. Mr. Gobrecht was previously chief project engineer of the Railway division of Budd Company.

RAILROAD SUPPLY & EQUIPMENT, INC.—Frank E. Ross of the Ross Company, 3408 Washington boulevard, St. Louis, has been appointed sales representative for all products of Railroad Supply & Equipment, Inc., at St. Louis.

OLIVER IRON & STEEL CORP.—John H. Van Moss, Sr., who recently retired from ACF Industries, Inc., has joined his

son, *John H. Jr.*, in his activities as a manufacturers sales representative and are now sales representatives to railroads and railroad equipment companies in the Chicago, St. Louis and Omaha territory for Oliver & Iron & Steel.

MILLER BEARINGS COMPANY.—*Earle M. Harshbarger*, formerly railroad sales manager, SKF Industries, Inc., has become associated Miller Bearings Company, Lakeland, Fla., as manager of the railroad department.

AMERICAN BRAKE SHOE COMPANY, BRAKE SHOE & CASTINGS DIVISION.—*Charles R. Joyce* has been appointed eastern sales manager and *Daniel C. Poor*, district sales manager.

Mr. Joyce, formerly sales representative, joined Brake Shoe as an apprentice in 1948. He was appointed sales representative at Cleveland in 1950. He now is located at New York.

Mr. Poor started as a sales representative with Brake Shoe in 1948. Formerly located at the company's Chicago offices, he will now be located at their Cleveland offices.



H. R. Deubel

CHICAGO PNEUMATIC TOOL COMPANY.—*Harry R. Deubel*, western division manager, railroad sales, who has been appointed manager, railroad sales division, with headquarters remaining in Chicago.

A. M. BYERS COMPANY.—Byers has consolidated its sales and order department into a single unit, known as the sales-order department. *L. G. Hubbell*, formerly manager of the order department, is manager of the new department, and *C. H. Flinn*, chief clerk of the sales department, is assistant manager.

AXELSON MANUFACTURING COMPANY.—*Arthur F. White* has been appointed Detroit district manager, in charge of district factory sales for the Lathe and Milling Machine Divisions.

ARO EQUIPMENT CORPORATION.—*J. Edwin Heath* has been appointed division manager in the sales department, covering North and South Carolina, Virginia, Western Virginia and Tennessee. *Gene R. Voight* has been appointed assistant to the general manager of the Air

Tool Division, with headquarters in Bryan, Ohio. *Don L. Anderson* has been appointed assistant division manager in the greater Milwaukee area.

COOPER-BESSEMER CORPORATION.—*Fletcher Devin* has been elected a vice-president.

Mr. Devin, who started with the original C & G Cooper Company in 1919, became branch manager of the company's office at Dallas, Tex., in 1924, and district manager at Mount Vernon, Ohio, in 1926. For the past 20 years he has directed the development of Cooper-Bessemer's loco-

motive markets for diesel engines. He is now also district sales manager for the engineering and sale of engine-driven compressors used in gas pipeline transmission and in refinery service in Ohio, Kentucky, Michigan, West Virginia, and Tennessee.

Obituary

CECIL R. MILLS, 76, retired vice-president and director of the Simmons-Boardman Publishing Corporation, publishers of *Railway Locomotives and Cars*, died at Daytona Beach, Fla., March 28.



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C-D-F Silicone Tapes for A.I.E.E. Class H Electrical Insulation. Available in Varnished Fiberglass cloth and Silicone Rubber-coated Fiberglass cloth. Resistant to high temperatures; high dielectric strength, low dielectric losses, excellent moisture resistance and high tensile strength. They resist mild alkalis, non-oxidizing acids, mineral oils, oxygenated solvents. Available in a range of sizes on continuous rolls. Write for Technical Bulletin #47.

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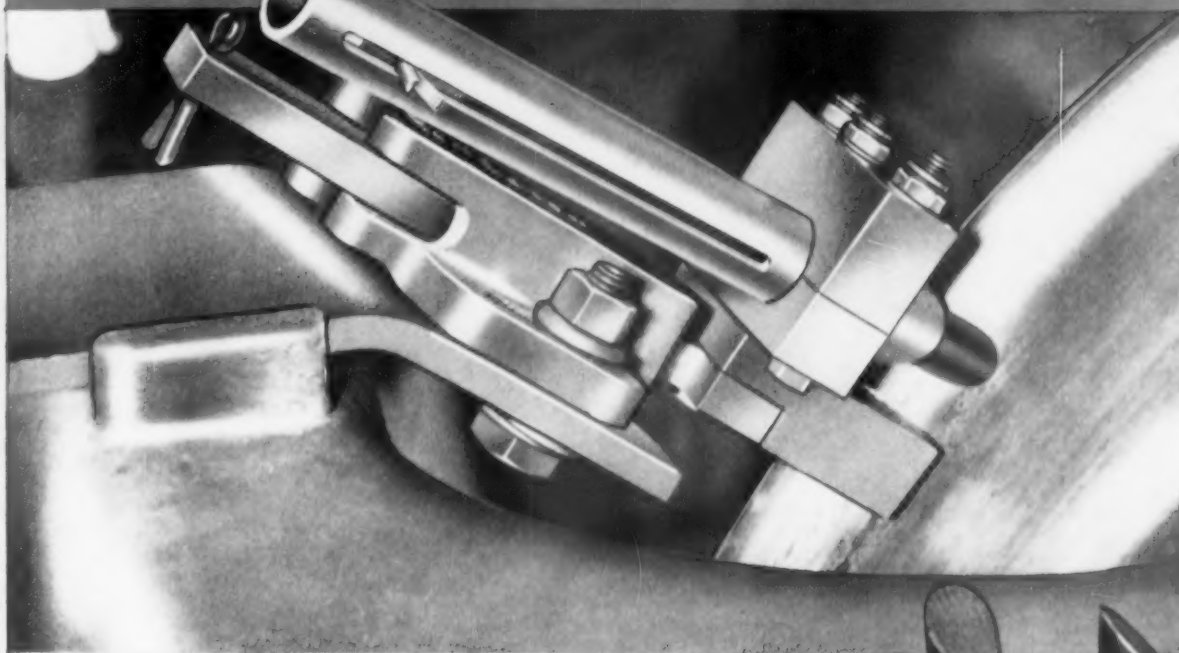
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